ROADS AND STREETS
MARCH 1952

91 extra ideas in Roads and Streets this month!

TRADE and business publications are one of industry's most important sources of information. And as readers know, these publications not only contain informative material in their editorial sections, but also offer a wealth of *extra* ideas in their advertising pages.

That's why these days, smart readers are giving both parts an extra-thorough combing. With costs on the rise and greater output a must, ideas that help a company boost its efficiency are more valuable today than they have ever been.

In this issue of Roads and Streets, there are 91 advertisements, many of them containing ideas that may help *your* business. And if you manufacture or buy machinery of any kind, we believe you'll find helpful information in the Timken® tapered roller bearing advertisements that appear regularly in this publication. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF
TAPERED ROLLER BEARINGS

NEW!
THE TR 200
REAR DUMP
MOTOR WAGON

TR 200 MOTOR WAGON SPECIFICATIONS

Here's your *NEW* LaPLANT-CHOATE *ROCK WAGON*

HERE'S a new addition to the well-known LaPlant-Choate line of Motor Wagons and Earthmovers. The 18-ton TR 200 is a hydraulically-controlled rear dump wagon flexibly joined to the same big rubber-tired tractor so successfully used on the LaPlant-Choate TS 200 Motor Scraper. It combines rugged power, big capacity and high speed with a host of other features to make this unit outstanding in its field.

FEATURES YOU'VE BEEN LOOKING FOR IN A REAR DUMP WAGON

- Stable wheel base assures absolute safety when dumping over edge.
- Rock Lug tires.
- Protected cab.
- Your choice of two diesel engines in the T 200 Tractor . . . a 176 HP Buda or a 165 HP Cummins.
- No obstructions in the wagon body.
- Tilts to 70° from horizontal.
- Full hydraulic control.
- Rear dump advantages.
- Available with heated body for use in cold climate to prevent freezing of material in load.

GENERAL

CAPACITY	
Struck, cu. yds.	11
Heaped, cu. yds.	15
Tons	18
OVERALL DIMENSIONS	
Length	25'9"
Width	10'7"
Height	10'0"
WHEEL BASE	13'7"
WHEEL TREAD	
Tractor	6'8"
Wagon	8'8"
TIRES	4—21.00 x 25—24 ply rock lug
BRAKES	
4-wheel air Timken-Detroit	18" x 7"
TURNING	
Width required 180° turn	31'3"
Degree of turn each way	60°
HYDRAULIC SYSTEM LPC Fluid Power Unit	
Steering—25 GPM	Model HU25
Wagon operation—40 GPM	Model HU40
SHIPPING WEIGHT (Approx. in lbs.)	40,000

T 200 TRACTOR

ENGINE	
Buda Diesel Model 6-DA-779	176 HP
or	
Cummins Diesel Model HRB-600	165 HP
ENGINE CLUTCH	17" Lipe Rollway
TRANSMISSION	Fuller 5A1120
SPEEDS (at 1800 RPM—MPH)	From 2.46 to 21.63
STARTING METHOD	Electric 24 V
AIR COMPRESSOR	
Bendix-Westinghouse	7½ cu. ft. capacity
ELECTRIC SYSTEM	12 V
FUEL TANK CAPACITY—U. S. gallons	70

R 200 WAGON

MISCELLANEOUS DIMENSIONS	
Loading height, rear	5'6"
Loading height, side	8'3"
Bowl width	8'0"
Bowl depth, maximum	4'8"
Bowl length	11'3"
OPERATING METHOD	
Type of ejection	Rear dump, hyd. lift
Number of jacks (double acting)	2
Size of jacks	8" x 31"
DUMPING ANGLE	70°

LaPLANT CHOATE

MANUFACTURING CO., INC. — CEDAR RAPIDS, IOWA, U. S. A.

Cable-operated Scrapers in 6-, 8- and 14-yd. sizes for all makes of track-type tractors.

2- and 4-yd. Scrapers for track-type and rubber-tired industrial tractors.

Hydraulic and Cable-operated Dozers.

Four-Lane Road in Pennsylvania Coal Region

Bethlehem Reinforcing Bars used in railroad bridge that spans 48 ft of highway. Notice lane of completed pavement in left background.

Checking the blueprints. *Left to right:* J. D. Montgomery, superintendent for F. D. Kessler, Inc.; Thomas Glaudel, junior inspector, and Adolph Kerewicz, resident engineer, both of Pennsylvania Dept. of Highways.

Two men place Bethlehem Dowel Unit quickly and easily. Unit is designed to help solve the load-transfer problems caused by heavy wheel loads.

Continuing its road-modernization program, the Pennsylvania Department of Highways recently authorized relocation of Route 29 between Hazleton and Tamaqua. The new road is four lanes wide and relatively free of turns. F. D. Kessler, Inc., Northumberland, Pa., was the contractor for the 3¼-mile section pictured here. Bethlehem furnished bar mats, dowel units and reinforcing steel.

Bethlehem Hinged Bar Mat is handled by only two men. With bottom section placed, hinged portion needs but slight push to fall into position.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

STEEL FOR HIGHWAYS

Dowel Units • Reinforcing Bars • Bar Mats • Guard Rail
Guard Rail Posts • Wire Rope and Strand • Pipe
Hollow Drill Steel • Spikes • Bolts and Nuts
Timber Bridge Hardware • Tie-Rods
Sheet- and H-Piling • Fabricated Structural Steel

BETHLEHEM STEEL

ROADS AND STREETS

March, 1952 • Vol. 95 • No. 3

Roads and Streets represents 60 years of continuous publishing in the highway field; combined with Engineering & Contracting and Good Roads Magazines, established in 1892

E. S. GILLETTE, Publisher

CCA

HALBERT P. GILLETTE, Editor-in-Chief

H. J. CONWAY, Assistant Publisher

Coming Articles

Grading and Paving Entire New City in Single Year

Soil mechanics and precision grading residential saved contractor money in mass home building project—streets for 17,000 new homes in mushrooming Lakewood, Calif.

The Oklahoma Turnpike—a Behind-the-Scenes Report

How the pavement design was arrived at and adopted for this project, scheduled for completion in 1952

Two Miles of Looped Rail Spur Helped this Contractor

Savin Construction Corporation's much-discussed plant layout for its New Jersey Turnpike job last year will be described in detail

Planning World's Longest All-Welded Highway Bridge

Some of the fine points in designing a major structural welding project are analyzed in this authoritative report on a California viaduct

"Sufficiency Ratings." What Does the Term Mean?

Roads and Streets is privileged to reproduce a summary by Carl Fritts of the Automotive Safety Foundation, and a summary of the Virginia road-need study based on this important new tool of highway planning

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundation and grade separations, and to the construction and maintenance of airports.

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THE BOOM Doesn't Make The Machine
TOO often equipment buyers buy convertibility with only a change of booms in mind.
The Boom doesn't make the Machine! Real Convertibility — the things that make a machine a leader whether operating as a Shovel, as a Crane, as a Dragline, or as a Pullshovel, comes from the combination of design, materials, balance, engineering— all the tangible and intangible qualities that result from years of experience.
Real Convertibility is a combination of Basic Machine and Attachments!
The original Northwest *was built* as a convertible unit and Northwest has so combined design and materials to give superior performance and higher output in each class of service — Shovel, Crane, Dragline or Pullshovel.
Convertibility is important. You can have it at its best. Why not place an order for a Northwest? Plan ahead and follow the Northwest Crowd.
NORTHWEST ENGINEERING COMPANY
1504 Field Bldg., 135 South LaSalle Street • Chicago 3, Illinois
NORTHWEST
CRAWLER and TRUCK MOUNTED SHOVELS • CRANES • DRAGLINES • PULLSHOVELS
VEIGH ALL THE ADVANTAGES

Marion 10-yd. Rock Body, equipped with twin telescopic, double-acting hoist, for off-the-road operation.

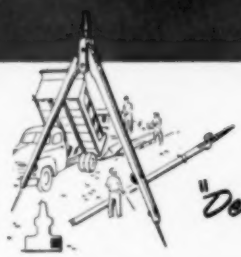
A New Approach To Special Haulage Problems

● Marion offers a new approach to your haulage problems . . . an experienced approach that is coupled with engineering and manufacturing ability to design and produce whatever body and hoist equipment is needed for your particular operation.

Marion produces many standard models, too —we feel they are the finest on the market. But if your transporation needs call for something a little different, or even radically different, Marion can design and build it for you . . . quickly and economically.

To those who want experienced, imaginative assistance in the review of their haulage procedures, Marion offers a service which is unmatched in the industry today.

Your inquiries are welcome.



"Designed on the Job"

MARION
BODIES AND HOISTS

METAL PRODUCTS CO.
Marion, Ohio, U. S. A.

Manufacturing a complete line of standard and special hydraulic hoists and dump bodies.

P&H GIVES YOU ALL 3

1. GREATER STABILITY
Lets you put more on the hook — and work faster.

2. MORE MODERN DESIGN
Live roller circle • Low pressure hydraulic control • True tractor type crawlers • All-welded construction.

3. PROMPT, NATION-WIDE SERVICE
P&H service is fast, efficient. Your dealer carries genuine P&H repair parts — backed by 20 strategically located branch offices and warehouses.

P&H POWER SHOVELS AND CRANES
4496 W. National Ave.
Milwaukee 14, Wis.
HARNISCHFEGER CORPORATION

See your P&H Dealer

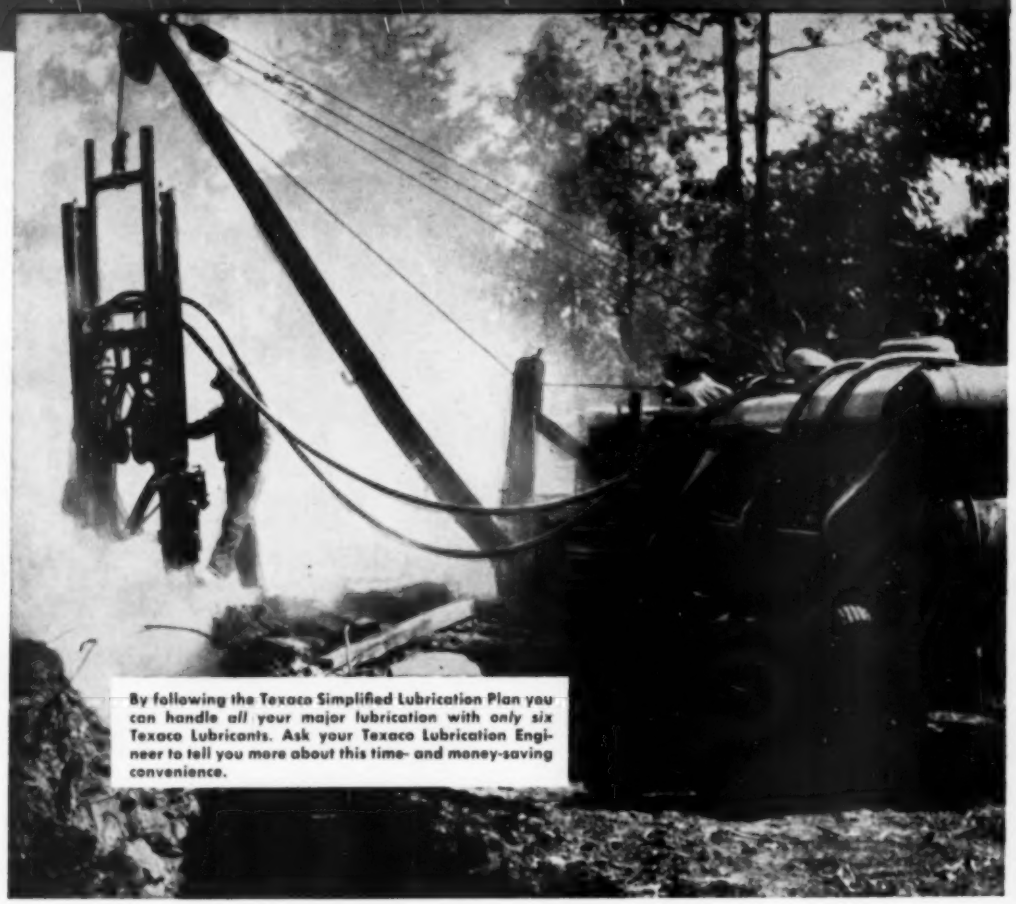
P&H Excavators and Truck Cranes are more easily converted for the various types of service shown below—with hoist and digging drums on one shaft, the need for auxiliary shafts and gearing is eliminated. You also have a choice of gas, Diesel or electric power. Ask for literature on the size you need.

the P&H *Line*

POWER SHOVELS • CRAWLER AND TRUCK CRANES • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • DIESEL ENGINES • PRE-FAB. HOMES

Under ANY conditions... with ANY compressor

MORE EFFICIENT



By following the Texaco Simplified Lubrication Plan you can handle *all* your major lubrication with *only six* Texaco Lubricants. Ask your Texaco Lubrication Engineer to tell you more about this time- and money-saving convenience.

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

TEXACO

TEXACO

PERFORMANCE...

Photo courtesy Gardner-Denver Co.

when you use the recommended
Texaco air compressor oil

Whatever the size or type of your compressors or whatever the operating conditions, you can have a Texaco air compressor oil *exactly right* to step up performance and bring down your maintenance costs. Let a Texaco Lubrication Engineer survey your setup and recommend which to use. For example –

★★You can overcome rusting in compressors and systems by using a Texaco *rust-inhibited* air compressor oil.

★★You can eliminate the excessive wear caused by "wet cylinders" by using a Texaco *compounded* air compressor oil.

★★You can avoid the harmful carbon and gum that form under severe conditions by using a Texaco *heavy-duty* air compressor oil.

★★You can keep compressors clean and efficient in normal operation by using a Texaco *straight mineral* air compressor oil.

FOR YOUR ROCK DRILLS use *Texaco Rock Drill Lubricant EP.* This "extreme pressure" lubricant is your best protection against wear, your best guardian against rust whether drills are running or idle. Count on it for longer drill life and lower maintenance costs.

A Texaco Lubrication Engineer will gladly work with you to keep all your equipment in condition to produce more at lower cost. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

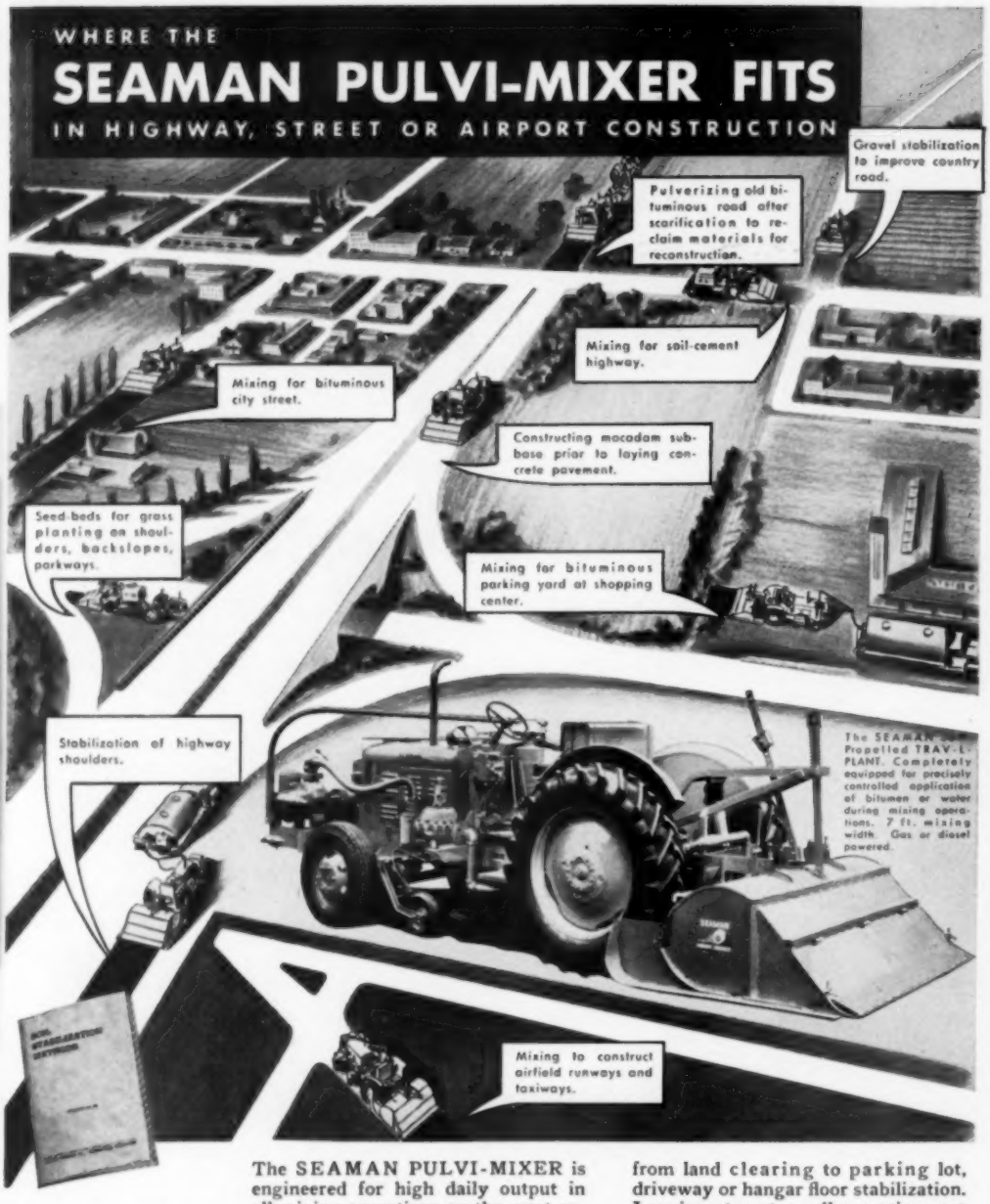
Lubricants and Fuels
FOR ALL CONTRACTORS' EQUIPMENT

Faithfully yours 50 *for Fifty Years*

WHERE THE

SEAMAN PULVI-MIXER FITS

IN HIGHWAY, STREET OR AIRPORT CONSTRUCTION


Gravel stabilization to improve country road.
Pulverizing old bituminous road after scarification to reclaim materials for reconstruction.
Mixing for soil-cement highway.
Mixing for bituminous city street.
Constructing macadam subbase prior to laying concrete pavement.
Seed beds for grass planting on shoulders, backslopes, parkways.
Mixing for bituminous parking yard at shopping center.
Stabilization of highway shoulders.
The SEAMAN Self-Propelled TRAV-L-PLANT. Completely equipped for precisely controlled application of bitumen or water during mixing operations. 7 ft. mixing width. Gas or diesel powered.
Mixing to construct airfield runways and taxiways.

This **FREE** book, SOIL STABILIZATION METHODS, modern in every respect, compiled by SEAMAN engineers, gives you complete information on processing methods and on the many uses for the SEAMAN. Ask for Bulletin 25.

The SEAMAN PULVI-MIXER is engineered for high daily output in all mixing operations on the most extensive stabilized construction projects — utilizing any type of binder with any suitable aggregate or soil. In addition, the SEAMAN is profitable in a variety of work that ranges from land clearing to parking lot, driveway or hangar floor stabilization. Low investment, small operating cost and high maneuverability are the reasons for such versatility.

Glance at the applications shown above. Then—put a SEAMAN in your road or street construction plans.

SEAMAN MOTORS, INC.

291 N. 25TH ST. MILWAUKEE 3, WISCONSIN

300,000 YARDS

maintenance still too low to be figured

Two of the eight Worthington Blue Brute Wagon Drills that broke cost records for Rock Construction Corporation. Note the amount of line drilling.

President Walt Dunham and Engineer A. Bruce Lattanzi in the company's Downsville Dam office.

Two 500' Worthington Blue Brute Air Compressors supplying air for drills at the Downsville Dam.

Line drilling in blue stone is child's play to those Worthington Blue Brute Wagon Drills.

Rock Construction Corporation of Kingston, New York, working on the Downsville Dam weir and waste channel, got service out of eight wagon drills that constantly amazed them.

Walt Dunham, president, reported: "We have drilled as much as 700-800 feet per 8-hour day per machine. In 165 working days, the machines put out 300,000 cu yds with so little maintenance it can't be figured in cost per yard."

This job also used a number of Worthington Blue Brute Hand-Held Rock Drills. Says Mr. Dunham: "There has been absolutely no maintenance cost. Our operators like them better than anything they have ever used."

Worthington Blue Brute Rock Drill operating ahead of the wagons collaring hole for laying out line drilling.

Contractors everywhere know that a Worthington Blue Brute team—air compressor and tools—makes mincemeat out of even the toughest jobs. See your nearby Worthington distributor for a demonstration. Worthington Pump and Machinery Corporation, Construction Equipment Division, Dunellen, N. J.

WORTHINGTON

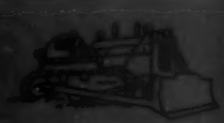
BUY BLUE BRUTES

H.1.5

IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

Big Red TD 24

TIGHT TURN AT THE TIP of old Cape Cod, a big International TD-24 crawler with a 21-yard heaped-capacity scraper wheels around to start another 1,800-foot haul on the new Mid-Cape Highway extension, near Truro, Massachusetts.



takes the Cape

BIG RED EQUIPMENT. Here are three of the five Internationals on this job, dozing and hauling the loose, shifting Cape Cod sand. In some bogs, peat has to be replaced with sand, and 50-foot piles driven in for stability of the roadway.

Makes tracks near Truro on sand-slowed highway job

Out near the tip of Cape Cod, where the Pilgrims saw their first tracks of redskins in the sand, today's tourists see the tracks of big red Internationals.

They're extending the Mid-Cape Highway, and where the land isn't sand, it's bog and marsh. It's so bad the S & M Construction Company, of Providence, R. I., won't let many of its vehicles venture off the pavement. But the Internationals charge ahead, moving nearly half-a-million cubic yards of sand to build three miles of road.

Pride of the whole show is "Big Red"—the TD-24—pulling bigger loads faster than any other crawler can.

And here's what an S & M operator says about it: "I wasn't on this rig very long before I found out it was mighty nice to handle. I really pull plenty of dirt!"

"Big Red", with 148 maximum drawbar horsepower and up to 7.8 mph, has more power and speed than any other crawler on the market. And it has finger-tip maneuverability to make pivot turns, feathered turns, and turns with power on both tracks.

All this means a faster work-cycle and more paydirt moved per day.

Ask your International Industrial Distributor for details on the TD-24. Ask him, too, about his fast, ready service and speedy parts delivery. Get all the answers . . . and you'll be a TD-24 man from then on in!

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

INTERNATIONAL

POWER THAT PAYS

INTERNATIONAL HARVESTER

Here's how Barron County and moving dirt...

BARRON COUNTY, Wisconsin, is now working their C Tournadozer through its third full season of heavy-duty snow plowing. Performance of the 19 m.p.h. rubber-tired rig has drawn high praise from county officials and taxpayers alike.

Clears 53 miles in 1 day

For example, one town committeeman reporting about a very heavy February blizzard, said, "Snow was drifted 9 and 10 ft. deep in the hollows, yet our Tournadozer cleared 53 miles of roads in Doyle Township in 11 hours."

"Best" for plowing driveways

A farmer whose driveway had just been plowed out by the Tournadozer exclaimed, "I've been watching plows in this country for more than 30 years, and I've never seen anything that can clear a driveway faster or better than this machine."

Works where trucks fail

County Highway Commissioner Elmer Rogers says, "The biggest advantage of the Tournadozer is that it can move over all types of roads . . . turn around in much less space than a truck . . . therefore goes into places where you wouldn't go with a truck. It opens a lot of roads we can't clear with 10-ton trucks . . . breaks through new snow very well."

19 m.p.h. speeds on rubber make small dirt jobs economical

"Moreover," Rogers continues, "Tournadozer is a year-around production unit, while trucks and crawlers are not. In dirt season, our Tournadozer runs out and does small jobs in one-third of the time it takes anything else. Because of its high travel speeds, Tournadozer makes these jobs economical. We now do jobs we ordinarily couldn't touch."

Pulls Rooters, Scrapers, Grader

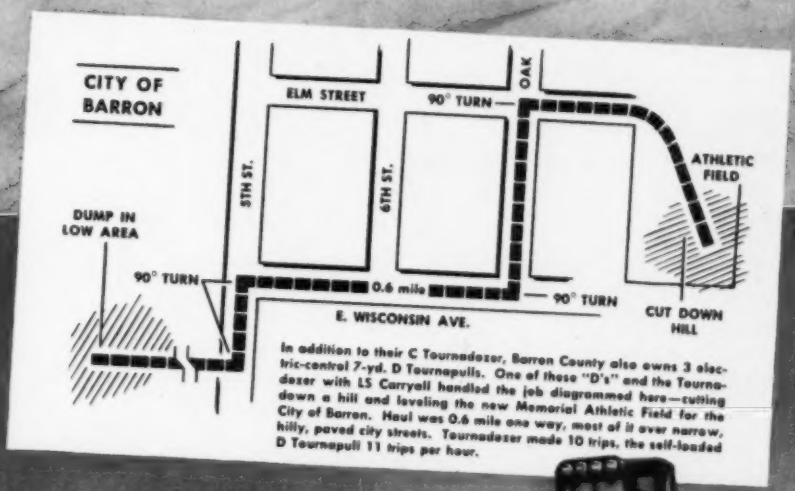
"To reconstruct a road in the town of Dallas, for example, our Tournadozer towed an LS Carryall over the highway . . . made the trip faster than we could have with a truck and trailer. On the job, Tournadozer pulled a Rooter through the cut area . . . coupled to the LS, self-loaded and hauled all the dirt . . . used its Bulldozer blade to doze fill around culverts . . . then, pulled an Adams construction grader to finish the work."

See your LeTourneau Distributor

You, too, will find this 186 h.p. dozer a year-'round time and money-saver on highway department maintenance and construction jobs as well as snow plowing. Get all the facts from your LeTourneau Distributor. Tournadozer can now be ordered with down-pressure blade attachment, fingertip electric shift and steer, and with torque converter for even better performance in tough conditions!

Tournadozer opens 200' driveway into country school in 2 minutes. High lift on plow blade (66" as compared to 8' for average truck) permitted turn-around in own tracks . . . shortened time needed for plowing path. Plow is quickly interchangeable with Bulldozer, Angledozer blade, Root Rake, Tree Pusher.

speeds up plowing snow



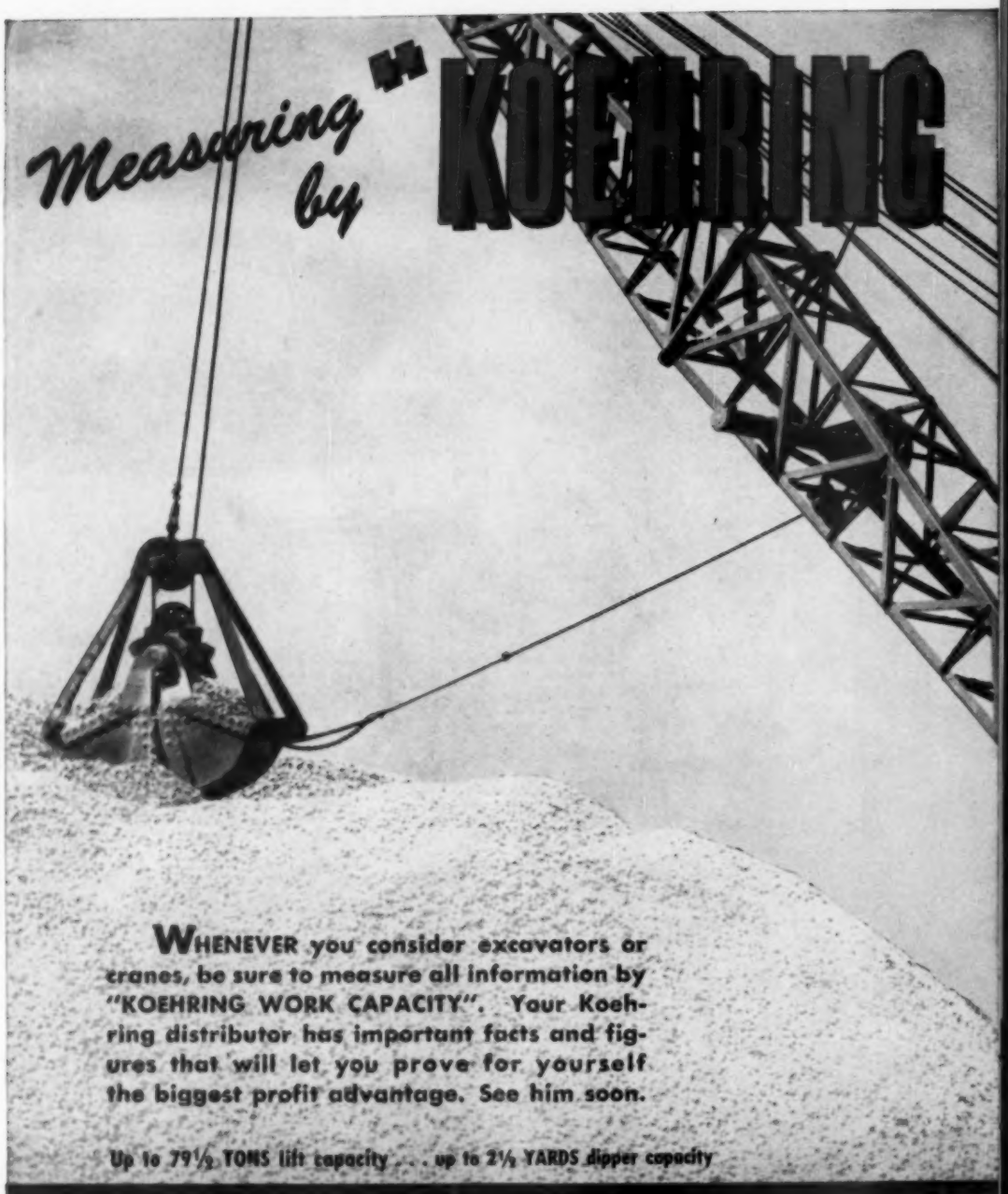
In addition to their C Tournadozer, Barron County also owns 3 electric-control 7-yd. D Tournapulls. One of these "D's" and the Tournadozer with LS Carryall handled the job diagrammed here—cutting down a hill and leveling the new Memorial Athletic Field for the City of Barron. Haul was 0.6 mile one way, most of it over narrow, hilly, paved city streets. Tournadozer made 10 trips, the self-loaded D Tournapull 11 trips per hour.

Widening road, Tournadozer continuously plows through 3 to 6 ft. drifts at 5 to 18 m.p.h. Big 21.00 x 35 low-pressure tires and adjustable runner shoe prevent damage to pavement and soft shoulders. Electrically-operated Snow Wing is available for benching.

R. G. LeTOURNEAU, INC.

Peoria, Illinois

HIGH-SPEED, RUBBER-TIRED EXCAVATING • HAULING • LIFTING EQUIPMENT



WHENEVER you consider excavators or cranes, be sure to measure all information by "KOEHRING WORK CAPACITY". Your Koehring distributor has important facts and figures that will let you prove for yourself the biggest profit advantage. See him soon.

Up to 79½ TONS lift capacity . . . up to 2½ YARDS dipper capacity

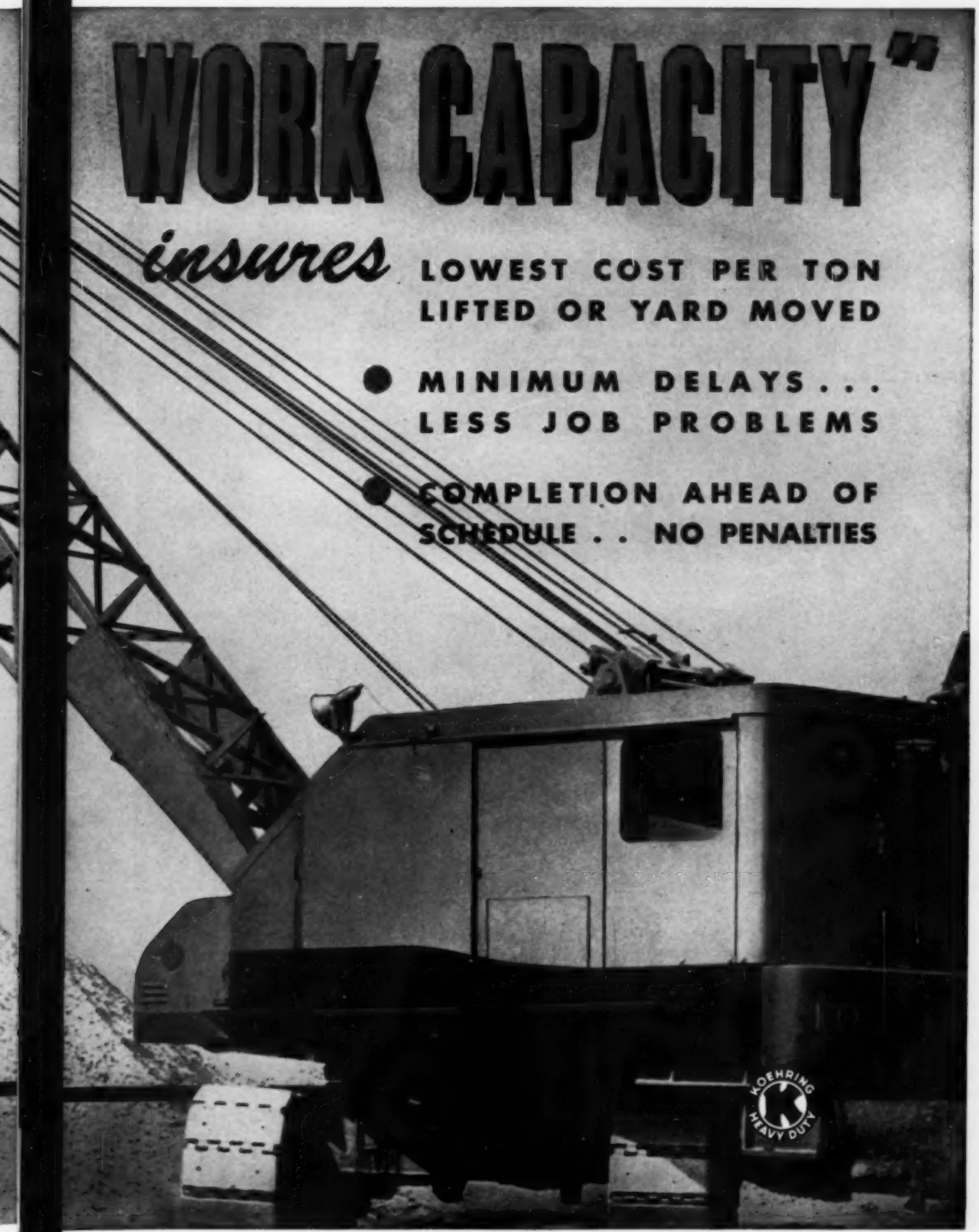
KOEHRING COMPANY
Milwaukee 16, Wis.

Subsidiaries: KWIK-MIX • PARSONS • JOHNSON

WORK CAPACITY"

insures LOWEST COST PER TON LIFTED OR YARD MOVED

- MINIMUM DELAYS . . . LESS JOB PROBLEMS
- COMPLETION AHEAD OF SCHEDULE . . NO PENALTIES



GULF PRODUCTS *and* FINE SERVICE

keep equipment rolling

on Long Island Parkway Project

Hendrickson Bros., Valley Stream, Long Island, have the contract for a sizeable portion of the work now under way on the Northern-Sagtikos Section of the Long Island Parkway System. The Hendrickson contract calls for 4.02 miles of Parkway grading, 4.76 miles of access road grading, and 1.26 miles of paving. The Northern-Sagtikos State Parkway and the Captree State Parkway are the final links in the chain of the Long Island State Parkway System.

"WE have used Gulf lubricants and fuels for over a quarter of a century because of their outstanding quality and their delivery to us when and where needed," says Mr. A. J. Hendrickson, President, Hendrickson Bros., Valley Stream, Long Island. "On this Parkway Project, we are getting the same fine equipment performance that we expect with Gulf products."

Gulf Quality Products and That Good Gulf Service team up to help many leading contractors do a faster, more profitable job.

Gulf lubricants provide better protection against wear, and contribute to extra hours of trouble-free operation.

Gulf gasolines and Diesel fuels are clean burning, have low carbon content, and contribute to maximum engine power and efficiency.

Gulf quality products and fine service are quickly available to you through more than 1400 warehouses in 31 states from Maine to New Mexico. Gulf Oil Corporation · Gulf Refining Company, Gulf Building, Pittsburgh 30, Pa.

GULF

WIRE ROPE

This is the most economical rope we've ever made for construction equipment

ROEBLING is the best known name in wire rope. That's partly because we were the first wire rope maker in America. But more than that, we've always led in developing better wire and better rope for every purpose.

Today's Roebling Preformed "Blue Center" Steel Wire Rope is the best choice for efficiency and long life on excavating and construction equipment. This rope has *extra* resistance to crushing and abrasion . . . stands up under rough going. It saves you time and cuts costs.

There's a Roebling wire rope of the right specification for top service on any job. Call on your Roebling Field Man for his recommendations. John A. Roebling's Sons Company, Trenton 2, New Jersey.

ROEBLING

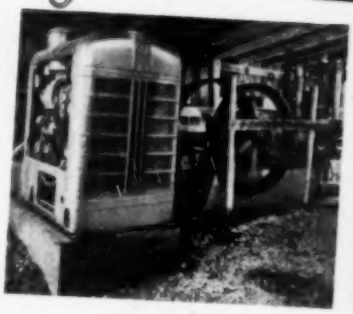
ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 701 ST. CLAIR AVE., N. E. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 5216 NAVIGATION BLVD. • LOS ANGELES, 5340 S. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

General Motors Diesel
Case History 5012-12

USER: United Feldspar Minerals Corp.
Spruce Pine, N. C.

INSTALLATION: 5-year-old GM 4-71 Diesel (used previously on sawmill) replaces steam engine on Ingersoll-Rand FR-1 compressor.

PERFORMANCE: Does as much work as 2 portable compressors with 4-cylinder gasoline engines and supplies more air. Maintains 100 lb. pressure for drilling. Cuts fuel costs 50%.



THIS DIESEL
does the work of two engines

Cuts fuel costs 50%—Supplies more air

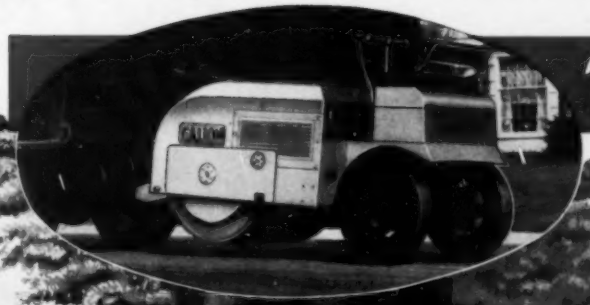
Here's another typical case of how General Motors Diesels take over any job—stick to it month after month—and do it better than either gasoline or steam. After four years on a sawmill—and with one minor overhaul—this 4-71 is now outperforming two 4-cylinder gasoline engines and cutting fuel costs in half. Whatever your need for power—in air compressors, trucks, tractors, cranes or crushers—why not learn firsthand how much more profitably and dependably the GM 2-cycle Diesel can deliver it? There's a GM Diesel distributor in your vicinity who'll gladly give you all the facts.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS, DETROIT 28, MICHIGAN
SINGLE ENGINES...32 to 275 H.P. MULTIPLE UNITS...Up to 600 H.P.

It pays to Standardize on

GM
DIESEL POWER

GALION VARIABLE WEIGHT PORTABLE ROLLERS



ATTACH AND TRANSPORT AS EASILY AS A TRAILER!

PROFITABLE TO USE

With the GALION Portable Roller you get outstanding features such as . . . hydraulic steering . . . rugged spur gear drive . . . variable weight . . . constant-mesh transmission . . . large diameter compaction roll . . . 42" rolling width . . . 25 h.p., 4 cylinder gasoline engine. No other roller of equal compaction efficiency is so easy to transport from job to job. Ideal for maintenance work and miscellaneous rolling jobs.

Write for literature.

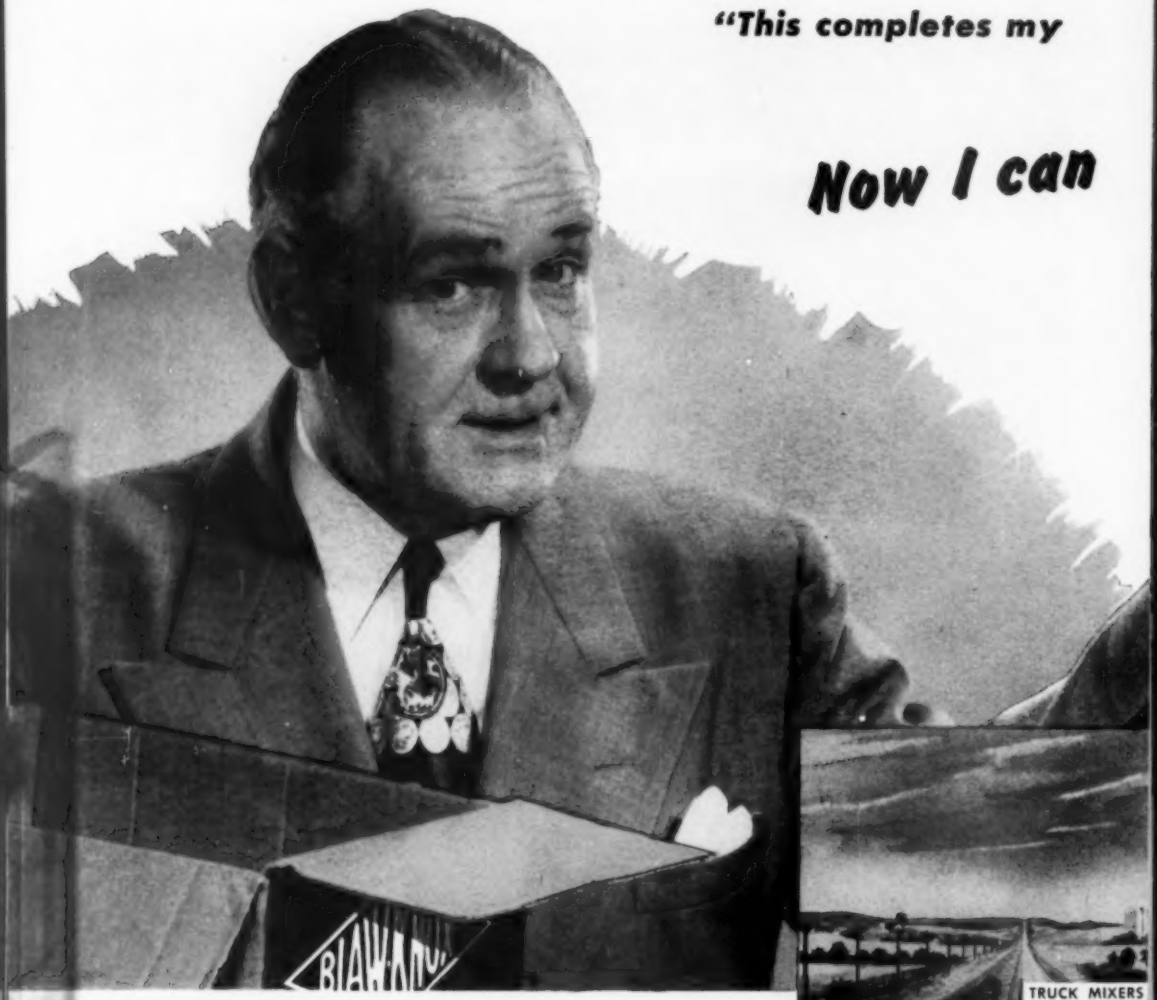
GALION

ESTABLISHED 1907 **MOTOR GRADERS • ROLLERS**

THE GALION IRON WORKS & MFG. CO., General and Export Offices — Galion, Ohio, U. S. A.
Cable address: GALIONIRON, Galion, Ohio

"This completes my

Now I can



BLAW-KNOX Spreader-Vibrator and Finishing Machine working on Edens Expressway near Chicago. The vibrating pan on the Spreader assured proper densification throughout the slab, even though an exceptionally stiff mix of air-entrained concrete was specified. A finish tolerance of ⅛" in 10' was required. Other Blaw-Knox equipment in this "Complete Package" included Aggregate and Cement Batching Plants, Finishing Machines and Self-Aligning Steel Road Forms. MultiFoote Pavers placed the concrete.

BLAW-KNOX 'Package'...

handle any concrete paving job!"

I'VE really increased the type of jobs I can handle by completing my Blaw-Knox "package" of concrete paving equipment, and so can you, to get ready for the big construction days ahead.

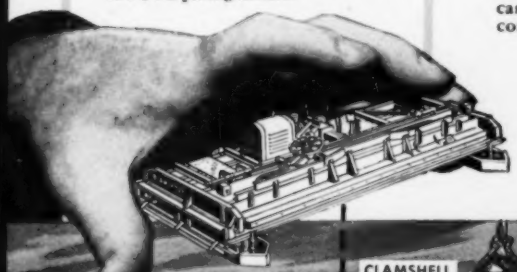
In the "Complete Package" you get *all* the equipment you need, from forms to finisher. You can use the entire set-up for the big jobs, or choose the units you need for whatever job comes up . . . roads, streets, airports, or even dams or bridges. And you can be sure of getting *all* the advantages of a "packaged" system . . . smooth, low-cost production-line operation, with each highly productive unit integrated with the others for big output at a steady, profitable pace.

You get a further profit pay-off in the *one-source* conveniences of a "Complete Package" . . . all your equipment from one responsible manufacturer vitally interested in your success, with only one financial contact, and backed by one construction-minded distributor organization working hand in glove with you to assure prompt, efficient service in parts and maintenance. One Blaw-Knox trained man can service *all* your "Complete Package" equipment! You can get the entire package on one order and in one shipment if you like, or choose the equipment you need *now*, then add the others as your needs increase.

Remember, when you have the Blaw-Knox "Complete Package", you can handle any concrete construction job faster, better and at the lower costs that assure profit.

BLAW-KNOX PAVING SPREADERS

Like the other equipment in the "Complete Package", Blaw-Knox Paving Spreaders are designed for record-smashing production and high quality performance. By using the vibratory pan attachment on the Spreader, exceptionally uniform, dense concrete free from difficult finishing problems, can be obtained. This 20-25-ft. adjustable spreader, with the automatic transverse blade, can handle the maximum output of two 34-E paving mixers.



BLAW-KNOX

BLAW-KNOX DIVISION of Blaw-Knox Company

Farmers Bank Bldg. • Pittsburgh 22, Pa.

NEW YORK • CHICAGO • PHILADELPHIA

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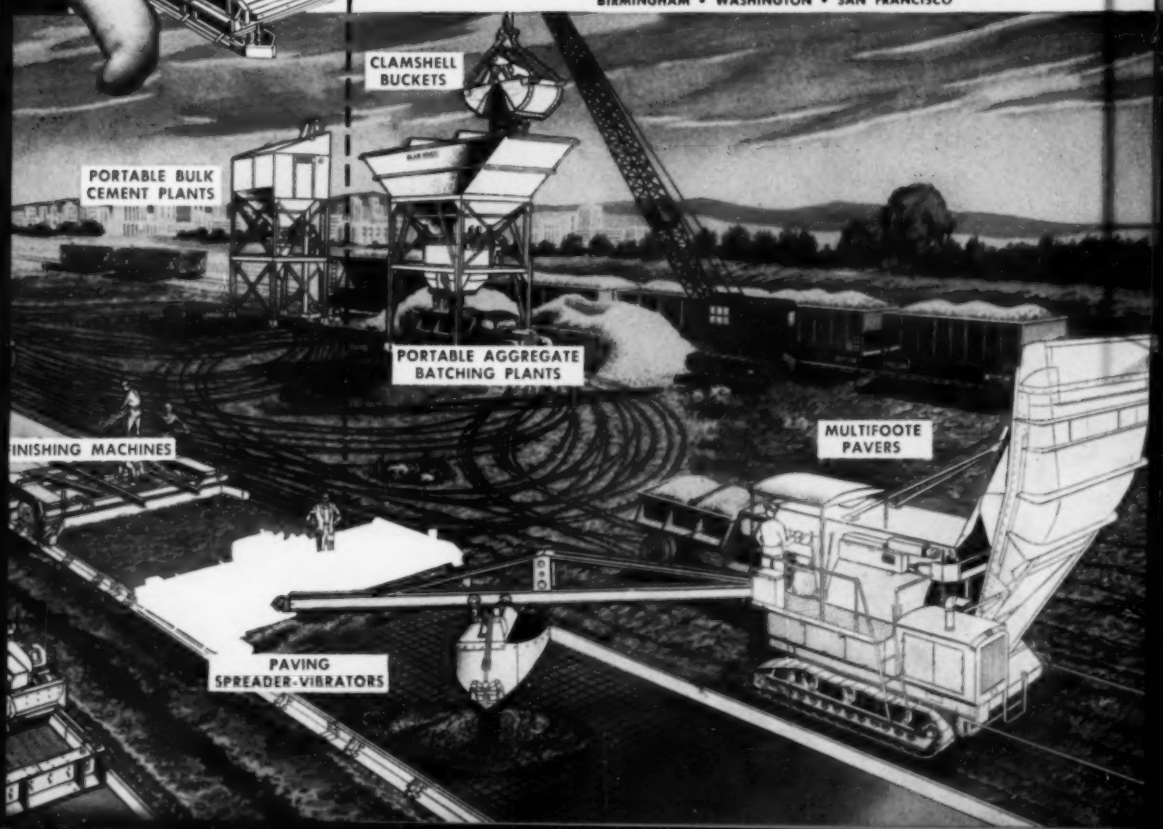


When the going's rugged...

that Pioneer Edge

Contractor Praises Pioneer Equipment

It wasn't by accident that Winston Bros. chose a Pioneer plant to handle this rough, tough "Ridge Route" job. The firm is well acquainted with the advantages of Pioneer equipment. Just recently they told us, "We have three of your quarry and washing plants on our projects in Colombia, South America. Project managers report very satisfactory results with little delay caused by breakdown. This is very important because the equipment is so far from the source of supply."

BUY BOTH!
HIGHER OUTPUT
LOWER UPKEEP

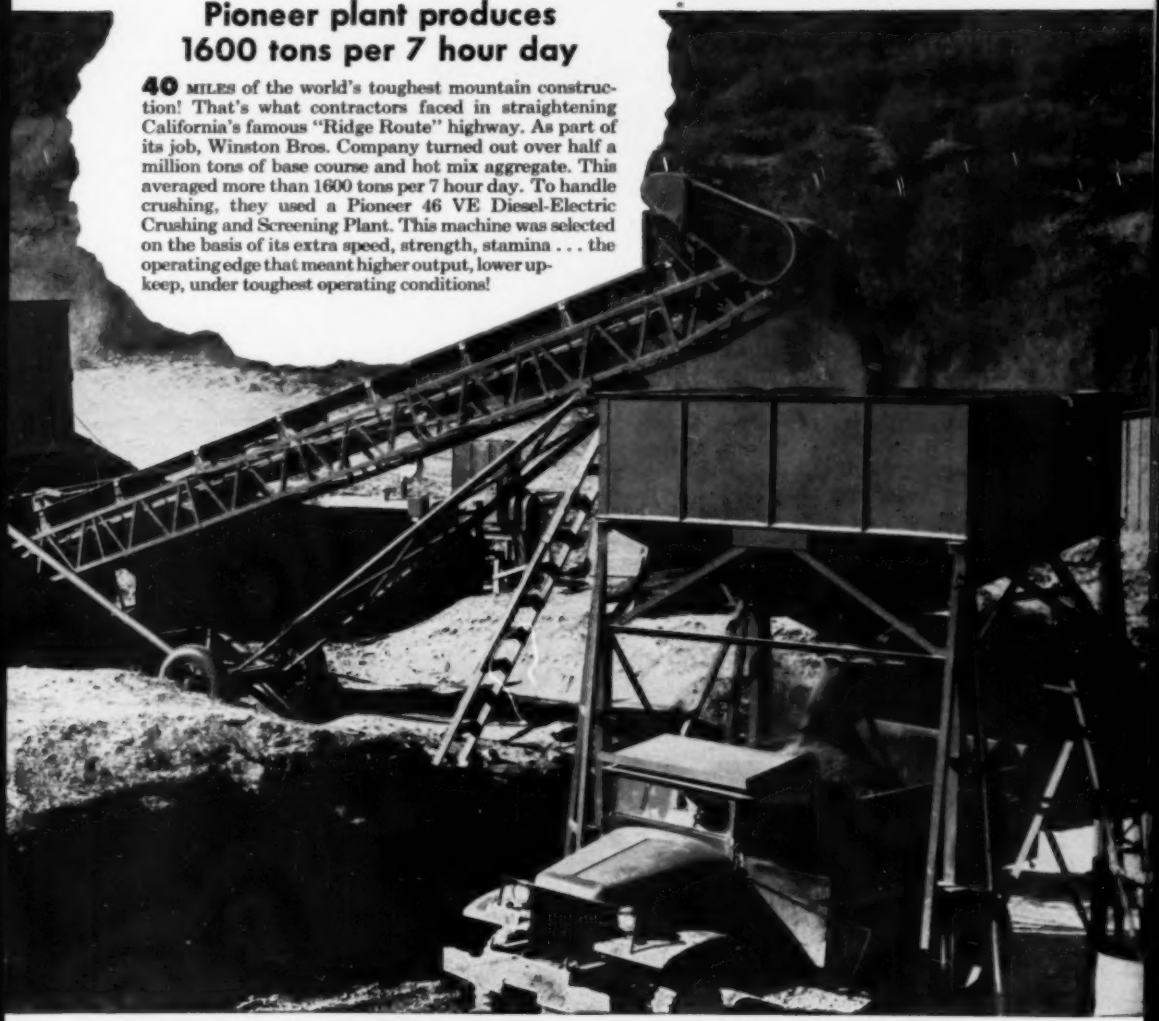
Pioneer

Continuflo EQUIPMENT

sees you through

Pioneer plant produces 1600 tons per 7 hour day

40 MILES of the world's toughest mountain construction! That's what contractors faced in straightening California's famous "Ridge Route" highway. As part of its job, Winston Bros. Company turned out over half a million tons of base course and hot mix aggregate. This averaged more than 1600 tons per 7 hour day. To handle crushing, they used a Pioneer 46 VE Diesel-Electric Crushing and Screening Plant. This machine was selected on the basis of its extra speed, strength, stamina . . . the operating edge that meant higher output, lower upkeep, under toughest operating conditions!



***Before you bid... check with* Pioneer**

The operator who has an edge in equipment has a very definite advantage in bidding. Pioneer equipment gives you an operating edge over and above its rated performance. Before you bid on your next job . . . check with Pioneer.

PIONEER ENGINEERING WORKS
1515 Central Avenue • Minneapolis 13, Minnesota

● Please send me information on the equipment checked.

☐ GRAVEL PLANTS	☐ WASHING PLANTS	☐ MECHANICAL FEEDERS
☐ ROCK PLANTS	☐ BITUMINOUS PLANTS	☐ VIBRATING SCREENS
☐ JAW CRUSHERS	☐ APRON FEEDERS	☐ BUZZER SCREENS (LIGHT DUTY)
☐ ROLL CRUSHERS	☐ ORO FEEDERS	☐ CONTINUFLO CONVEYORS

*Name*_____

*Company*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

Super-portable, the Flex-Plane Detroit Special can be pulled from the forms and fashioned into a completely mobile trailer in 10 seconds. Telescopic, this machine has the widest range of working widths available today.

FLEX-PLANE SUPER-PORTABLE FINISHING MACHINE PAYS DIVIDENDS WITH TEN-SECOND MOBILITY....

The Flex-Plane Detroit Special Finishing Machine is the most maneuverable, easiest-to-work-with finishing machine on the market today. A completely built-in hydraulic transportation rig enables the Detroit Special to be quickly moved from one job to another. In fact, it requires but 10 seconds to lower the pneumatic-tired wheels into position. The Detroit Special actually has all the mobility of any trailer — can be moved to any job regardless of the mileage. Important, too, is the fact that the Detroit Special has both screeds mounted outside the frame. This added accessibility means easier adjustment and maintenance. And this exclusive method of screed mounting enables Flex-Plane to build the Detroit Special of low slung design. It hugs the forms reducing weaving, twisting and excessive wear to an absolute minimum — assures even finishing job.

Designed for jobs where maneuverability pays off —

- **City Street Paving**
- **Airport Runway Extensions**
- **Expressway Construction**
- **State Highway Work**

For additional information contact your nearest Flex-Plane distributor or write for Bulletin M-111. ***The Flexible Road Joint Machine Company, Warren, Ohio.***

WHEREVER THERE'S CONCRETE

MECHANIZED Flex-Plane CONSTRUCTION EQUIPMENT

Note compact, low slung design. Transportation wheels are retracted. Heaviest masses of concrete are handled with ease.

Ruggedly constructed, the Detroit Special has reversible screeds that are mounted outside the frame for greater accessibility.

This "Cat" No. 12 Motor Grader, equipped with DoMor elevating grader, is side burrowing at the rate of between 500 and 600 yards per hour.

They help speed completion of atomic project

Building access road to the Dugway Proving Grounds, south of Tinipie, Utah, the Olof Nelson Construction Company relies heavily on "Caterpillar" equipment.

"We think 'Caterpillar' products are tops," says Mr. F. F. McKinnon, Secretary-Treasurer of Nelson. "Cost of maintenance is low and they've got a long life. We have an old RD8 we were going to scrap four years ago, but it's still going strong. We get good service from our 'Caterpillar' Dealer."

Among the "Caterpillar" units on this job are three No. 12 Motor Graders—one equipped with a DoMor elevating grader. Two "Cat" D13000 Engines power a Telsmith crusher. The crusher is fed by "Cat" Diesel Tractors with 'Dozers. Nelson's lineup also includes six more D8s, a D7 and a No. 112 Motor Grader.

Concentration on "Caterpillar" equipment pays off three ways—in higher production, lower maintenance costs and simplified service problems. Good care of your units pays off, too—you get *extra* working capacity and longer life. Considering defense demands, that's mighty important today. To get the most out of your "Caterpillar" rigs, treat them right—and keep in touch with your "Caterpillar" Dealer.

CATERPILLAR, PEORIA, ILLINOIS

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

This rugged job... required rugged Air Compressors

1. **THE JOB:** eliminating grading and sharp curves which necessitated removing 100,000 yards of rock. *Time:* approximately 55 days. *Location:* 2½ miles of road construction on Route 100 to the new extension of the Pennsylvania Turnpike.

2. **EQUIPMENT USED:** a 600 Schramm and two 315 Schramm Air Compressors, operating four Wagon Drills.

3. **CONTRACTOR:** C. W. Good, Lancaster, Penna. He comments: "The rock to be removed was extremely hard, a composition of Brandywine Granite and Limestone... but with Schramm Air Compressors and Wagon Drills on the job, we had no trouble keeping ahead of schedules."...

And:

"I can get the best performance out of Schramm Air Compressors... no loss of time for repairs, and, when replacements become necessary the interchangeability of parts on all Schramm Compressors has simplified the servicing irregardless of size or capacity."

Schramm Air Compressors range in size from 20 to 600 cu.ft. actual air delivery—for your specific requirement.

For full details write for free Schramm Booklet.

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The Compressor People

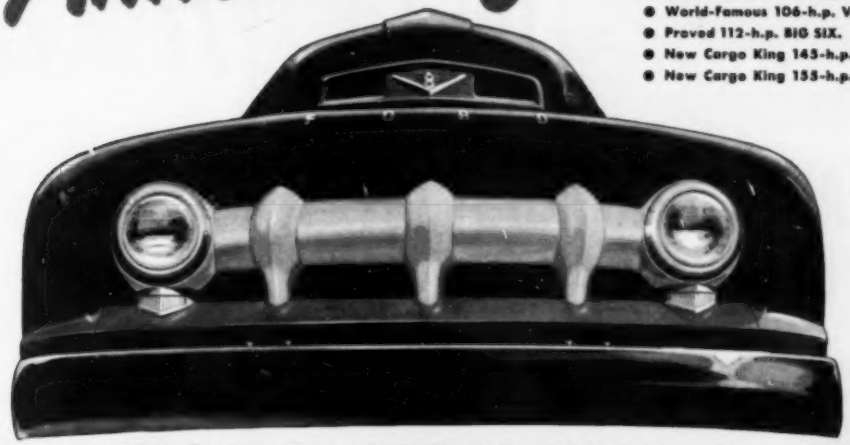
WEST CHESTER PENNSYLVANIA

SCHRAMM AIR COMPRESSORS

Announcing

NOW! FIVE GREAT FORD TRUCK ENGINES!

- New 101-h.p. Cost Clipper Six.
- World-Famous 106-h.p. V-8.
- Proved 112-h.p. BIG SIX.
- New Cargo King 145-h.p. V-8.
- New Cargo King 155-h.p. V-8.



New FORD TRUCKS for '52

Engineered for modern, low-cost Speed Hauling

NOW FIVE great Ford Truck engines permit better "tailoring" of truck power to your specific hauling job! Over 275 series power combinations. Only FORD in the low-price field gives you so many power choices, series for series, in ½-ton to 3-ton trucks!

3 NEW ULTRA-MODERN HIGH-COMPRESSION, LOW-FRICTION, OVERHEAD-VALVE ENGINES!

New Ford short-stroke LOW-FRICTION design saves up to 14% on gas! Two V-8's, one Six! Fully-proved! High-compression punch with *regular* gas!

EVERY drop filtered
EVERY time around

NEW FULL-FLOW OIL FILTER

Ford's new Full-Flow oil filter removes harmful dirt and abrasives from *every* drop of oil. Result: engine life is prolonged, ring and cylinder wear reduced.

IMPROVED POWER PILOT

Another Ford exclusive in the low-price field! This proved fuel-feeding and fuel-firing system gives you the most power from the least gas.

Availability of equipment, accessories and trim as illustrated is dependent on material supply conditions.

See "Ford Festival" starring James Melton on NBC-TV

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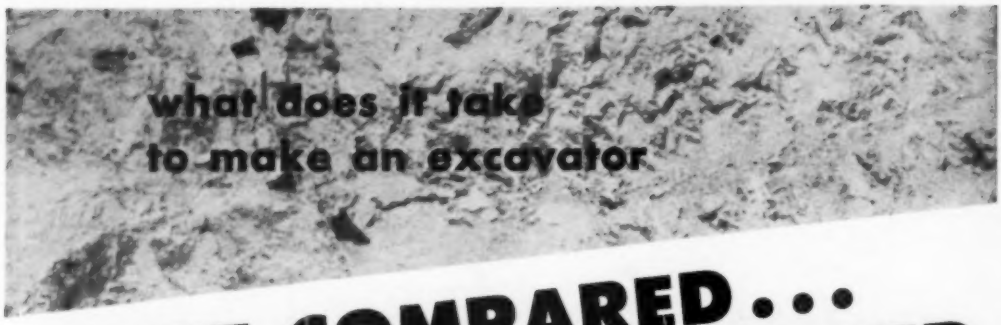
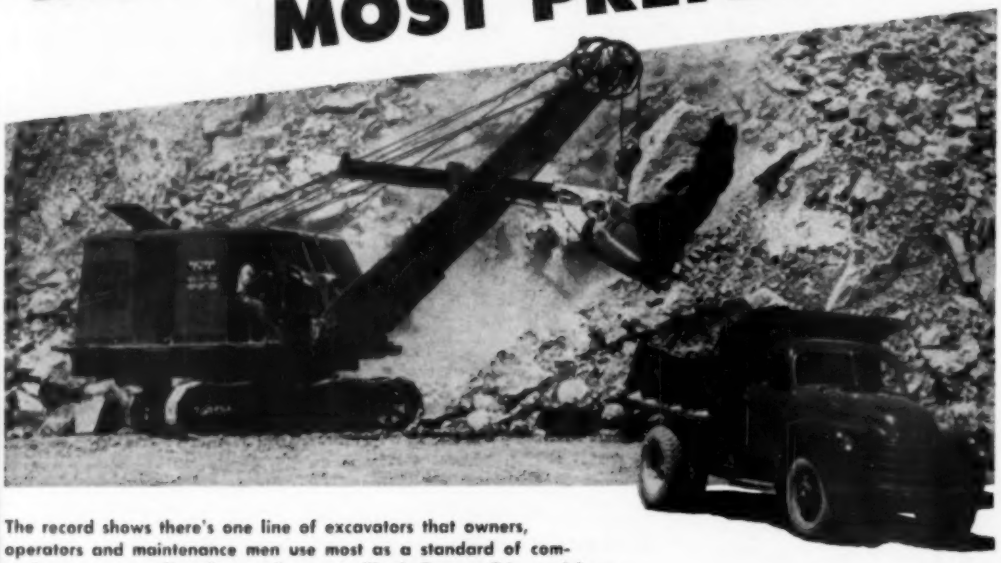


MOST COMPARED . . . MOST PREFERRED



The record shows there's one line of excavators that owners, operators and maintenance men use most as a standard of comparison . . . one line they prefer most. That's Bucyrus-Erie, and here are a few of the reasons why:

SIZE AND STRENGTH TO MATCH THE JOB. Seven different Bucyrus-Erie excavators are included in the ⅜- to 4-yard range of gas, diesel and single-motor electric machines. Each is designed as an entirely separate model. Materials and construction are specified for best results in each size. Complete facilities permit use of either welded or cast steel, plus special heat treatment, to meet design requirements and to provide extra long life.

PROVEN PERFORMANCE. Bucyrus-Erie design balance ties in all the phases of the operating cycle smoothly and efficiently for maximum output. Examples of this performance: yardage wise owners have bought more 10-B's than any other ⅜ yd. excavator; more Bucyrus-Eries for rock than any other make.

SERVICE — WHERE AND HOW YOU WANT IT. There are 63 Bucyrus-Erie distributors throughout the nation . . . one of them near you. Featuring expert mechanics and genuine Bucyrus-Erie parts, they're your assurance of fast, dependable service.

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY

SOUTH MILWAUKEE, WISCONSIN

Like Spring and Baseball

they Go Together

CONTROLLED TRACTION—product of exclusive All-Wheel Drive and All-Wheel Steer—makes it easy for an A-W Power Grader to deepen ditches and widen roads. The powerful front drivers ride the shoulder; the rear drivers follow the ditch line, and a beautiful "job of work" is turned out. Yes, All-Wheel Drive and All-Wheel Steer *go together . . . work together* on every job. Why be satisfied with less in your next grader?

AUSTIN-WESTERN COMPANY · *Subsidiary of Baldwin-Lima-Hamilton Corporation* · **AURORA, ILLINOIS, U.S.A.**

Austin Western

BALDWIN BLH LIMA-HAMILTON

Winching out, and simultaneously loading, a scraper outfit on a construction project in Tennessee. Hyster D7N towing winch mounted on a Caterpillar D7 tractor equipped with 75 dozer and front cable control.

...Don't let mud **bog down** your operations

HYSTER Winches have *R-E-A-C-H* and *Pull Power* for any construction job...

Hyster Tractor Winches are manufactured for use with Caterpillar D8, D7, D6, D4, D2 and DW-10 tractors. Included are Towing Winches, Worm Drive Winches, Hy-Speed Winches, Oil Well Servicing Winches, two and three drum Tractor Mounted Hoists.

Construction men all know the job insurance provided by a Hyster winch mounted on a Caterpillar diesel tractor. The winch MOVES heavy equipment; RESCUES mud-bogged equipment; INSURES against work stoppage or down-time on any project using equipment; PULLS the tractor itself out of mud or other situations that have immobilized the unit.

Hyster winches and other tractor tools are sold and serviced at more than 700 Caterpillar dealer stores around the world. Consult your dealer. Write for literature.

HYSTER COMPANY

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MORE THAN 40,000 SATISFIED WINCH OWNERS

Dearborn
EQUIPMENT

Ditch Work is one of many DEARBORN ROAD MAINTAINER Duties

DEARBORN SCOOP
...Handy on "Cut and Fill"

The stout Dearborn Scoop, with 5.7 cubic foot capacity, teams with the Ford Tractor to do scores of excavating, filling, and material moving jobs. Quick attaching.

DEARBORN SIDE MOUNTED MOWER
...For Fast Highway Mowing

This Dearborn Side Mounted Mower is built to mow highway shoulders, curbs, and rights of way—for fast cutting of big weeds to small brush. Ford Tractor Hydraulic Touch Control lifts and lowers cutter bar. 5' or 6' cut.

Effective ditch work, including cleaning and reshaping, is only one of many key road jobs on the long list of the Dearborn Road Maintainer.

It's built like a motor grader, with a 14-foot wheel base, for good blading performance. Weight concentrated on rear wheels, and the strong frame for firm circle support, contribute to blading without "chatter".

Powered by the Ford Tractor, the Dearborn Road Maintainer proves unusually capable at repairing frost-heaved roads—smoothing rutted or "washboard" surfaces—maintaining berms—helping spread surfacing materials.

Full range vertical blade positioning is under responsive hydraulic control, energized by a pump that takes power directly from the Ford Tractor's crankshaft. This Maintainer, with an approximate weight of 6,900 lbs., can put a pressure of 3,500 lbs. on its 8-foot blade.

This unit's fitness for maintenance and moderate grading uses, plus its reasonable price, offer some remarkable advantages to users!

For complete information, write Dept. I, Dearborn Motors Corporation, or get in touch with your nearby Ford Tractor dealer.

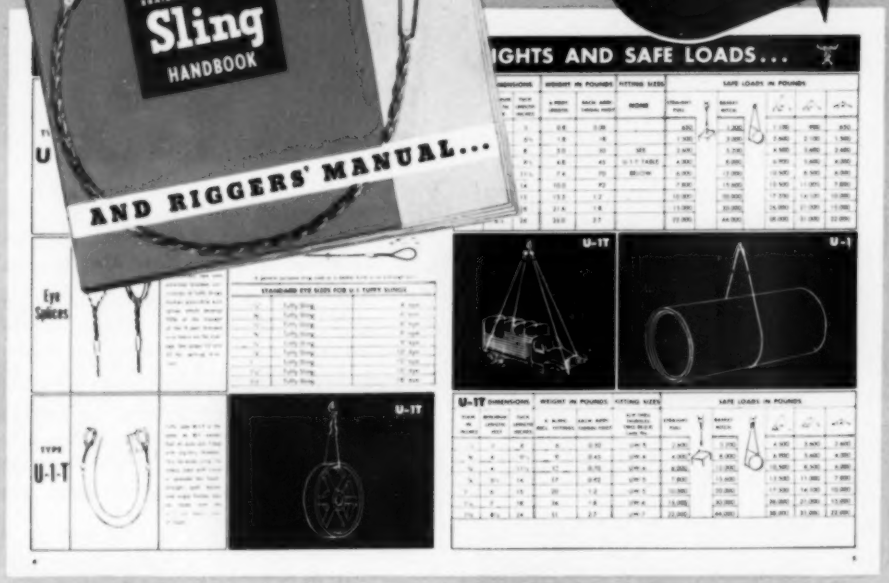
Ford
TRACTOR

DEARBORN MOTORS CORPORATION

Birmingham, Michigan

Just Off to Help

Free!



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the Press and Ready You Cut Sling Costs!

Only Handbook of its Kind in the Sling Field. You just can't measure Tuffy Slings by the old sling standards. Because of the new characteristics and efficiencies developed in Tuffy's 9 part, machine braided wire fabric construction, all users of slings need this Sling Handbook to know the facts about lower sling costs through longer sling service. You can have it FREE for the asking. It gives you—

Factual Data On 12 Sling Types and On Various Types of Sling Fittings. That's right, all the working data—dimensions, weights, safe loads, standard eye sizes, tuck lengths, sizes and data on standard and special fittings, straight pull, basket, choker and angle hitches, simplified ordering procedure, etc., on 12 factory fitted and factory packaged sling types. Also there is valuable information on sling care and on braided wire fabric for rigging your own slings.

30 Illustrations of Sling Uses—help you determine the types to fit your sling jobs. Should none of the 12 factory fitted types exactly fit, then the handbook tells how our engineers develop special types for special uses.

Step by Step, Illustrated Instructions On Splicing Both Tuffy Slings and Wire Rope. Splicing the braided wire fabric of Tuffy Slings is made easy with visual instructions. And, to make the sling handbook doubly useful, it contains 24 pages of visual instructions on making 7 kinds of wire rope splices, attaching sockets, ferrules and thimble clamp. Efficiencies of wire rope attachments, as established by actual strength tests, are tabulated.

You'll find this Sling Handbook and Riggers Manual easy to use and highly useful. A copy is yours with our compliments. Simply fill out and send the coupon.

Tie a knot in a Tuffy Sling. Note its flexibility. Pull the knot tight—then untie it. See how readily the patented braided fabric straightens out again.

It's hard to do by hand without the aid of a vise. If you are able to kink a Tuffy, then see how easily the patented braided wire fabric straightens out without material damage.

Get FREE Sling Sample—See For Yourself All The Advantages of Tuffy Slings

To see how entirely different they are you just have to handle and try out a Tuffy Sling. That's why we have made up a supply of 3 ft. samples. Get yours and prove for yourself Tuffy Sling superiority. Fill out the coupon—It's FREE.

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*Title*_____ *Company*_____

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Mack six-wheelers get you *out of the rough*

Rough terrain or hub-deep mud holds no terrors for Mack six-wheel trucks. You can count on these unfaltering Macks to take your loads "out of the rough"... to maintain steady, dependable schedules... because they have the unique advantage of Mack's *Balanced Bogie with exclusive Power Divider.*

With the Mack Power Divider, a non-spinning true differential, torque is divided between the two bogie axles and between the four driving wheels. Delivering torque smoothly and continuously without destructive shock in proportion to wheel traction, the Power Divider stops power waste through useless slipping and wheel spinning—keeps Macks moving where other trucks bog down.

If your present truck equipment is having a hard time because of hard going, it will pay you to investigate the benefits you get from Mack six-wheelers in unfailing reliability and uninterrupted production... greater profits through greater output at lower cost. Write or call your nearest Mack branch or distributor.

Mack Interaxle Power Divider

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In tough dump truck service Mack six-wheelers get you "out of the rough" with unfailing dependability.

CONSTRUCTION EQUIPMENT NEWS

A Preview of Equipment That Will Help You On the Job

PATCHES—TRENCHES SAWED FOR FLOOR—STREET REPAIR — Saw concrete floors, walks or streets! Saw narrow slit trenches 1" wide for conduit or any width for utility lines. Eliminate jackhammer fractures beyond the straight, smooth sawed lines.—**Write Clipper Mfg. Co., 2820 E. Warwick, Kansas City 8, Mo.**

FLOORS, DRIVES, RUNWAYS EASILY CUT FOR REPAIRS— Rail tunnels, rail and pipe trenches, air lines and machinery bases were cut in dense concrete with a Model C-130 Clipper Concrete Saw and CDS-20 Diamond Blade at the rate of 5' per minute—3" deep. Tremendous savings were claimed by the contractor in removal and replacement.—**Write Clipper Mfg. Co., 2820 E. Warwick, Kansas City 8, Mo.**

TRACK SAW NOW CUTS LARGEST STONE, TRANSITE, TERRA COTTA — By placing C-15 Clipper Concrete Saw on tracks, a Cleveland contractor cut limestone veneer units from 15'x7"x15" quarry lengths. In addition to large, bulky shapes this model is efficient and dustless for inside patch and trench work.—**Write Clipper Mfg. Co., 2820 E. Warwick, Kansas City 8, Mo.**

CONTRACTION JOINTS NOW SAWED—Floors, walks, drives and runways now poured continuously (reduces bulkheading!) Then joints are sawed to eliminate hand forming and costly spalling.—**Clipper Mfg. Co., 2820 E. Warwick, Kansas City 8, Mo.**

STUDIES OF SAWED JOINTS PROVE VIRTUAL ELIMINATION OF SPALLING — Highway transverse joints sawed 2" deep are devoid of spalling after 1½ years in contrast to heavy spalling in a few weeks on formed joints, according to State tests.

Typical spalling after few weeks heavy traffic.

Sawed joints on same highway after 1½ years.

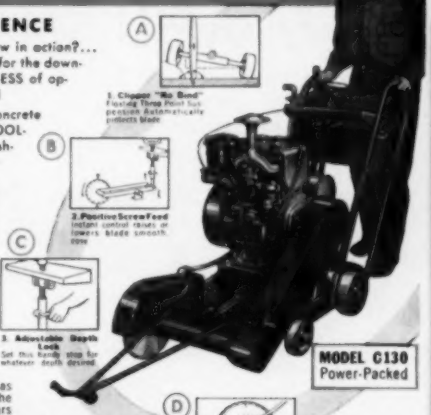
It's Done Easier, Faster, More Economical when you SAW BEFORE BREAKING with CLIPPER CONCRETE SAWS

CONCRETE EVIDENCE

Ever watch a Clipper Concrete Saw in action?... If not you've missed something... for the downright SPEED, EASE and SMOOTHNESS of operation is really something to see!

You'll recognize that Clipper Concrete Saws are designed for SIMPLE, FOOL-PROOF DUSTLESS performance. Dashboard controls—perfect balance—floating three point blade suspension* — and "job-rated" power plants...all combined for concrete and asphalt cutting far beyond anyones expectations.

*A pivoting front axle keeps the blade straight in the cut even on rough surfaces—stops binding — stops excessive blade costs.


A
1. Clipper "No Bind" Floating Three Point Suspension Automatically protects blade
B
2. Positive Screw Feed Instant control raises or lowers blade smoothly
C
3. Adjustable Depth Lock Set this handy stop for whatever depth desired
MODEL C130 Power-Packed
D
4. Patented Spray Control Its value is measured in increased Blade Life.

FREE TRIAL...

The outstanding policy of FREE TRIAL has been in effect since Clipper invented the World's First Masonry Saw many years ago! Clipper Concrete Saws are GUARANTEED to: Provide—regardless of hardness ...the Fastest Cut...at the Lowest Cost ...with the Greatest Ease. Anytime Anywhere! You be the judge ... TRY A CLIPPER ON FREE TRIAL!

Experience Proves A Concrete Saw Must Have These Clipper Features

Clipper

KANSAS CITY 8, MISSOURI

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Serving the World as the World's Largest Manufacturer of Masonry Saws

CLIPPER DIAMOND BLADES

• A complete selection of blade types for every sawing job ... SAW asphalt or concrete floors, or SAW contraction joints in fresh poured slabs.

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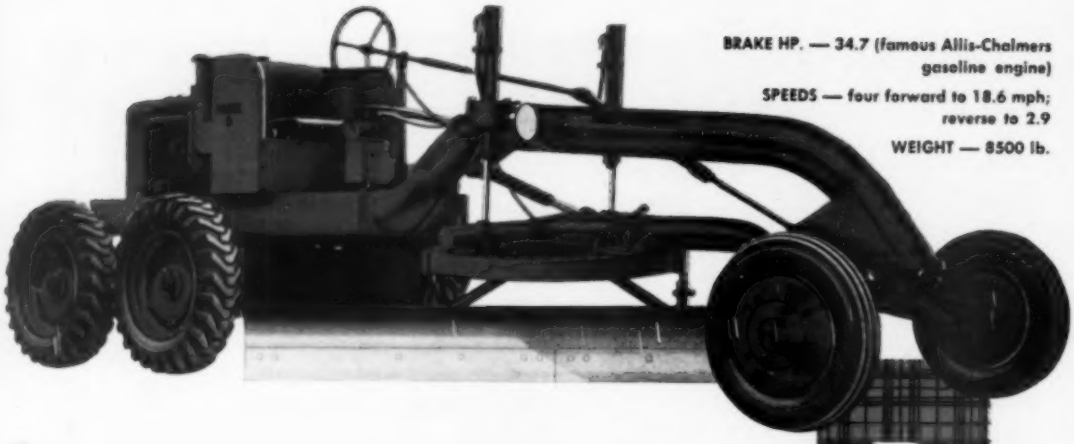

BRAKE HP. — 34.7 (famous Allis-Chalmers gasoline engine)
SPEEDS — four forward to 18.6 mph; reverse to 2.9
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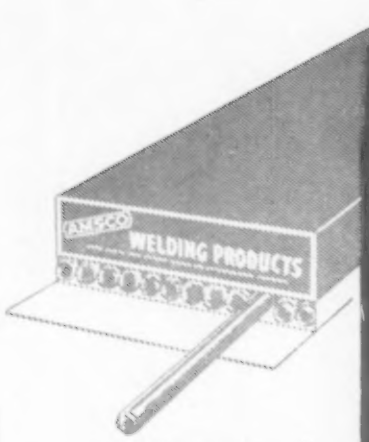
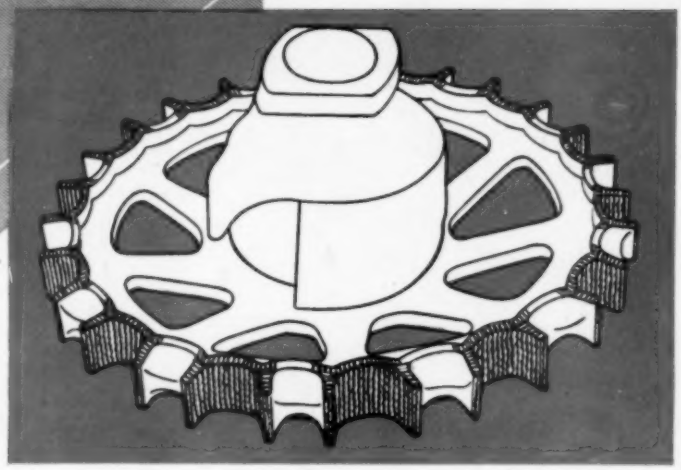


How AMSCOATING with Amsco Hardfacing Rods saves you materials . . . manpower . . . money.



These teeth take bites out of repair costs!

AMSCO Tungsten Carbide now available for prompt shipment!

AMSCO Tungrod: excellent for parts exposed to severe abrasion, such as bits and boring tools.

AMSCO Tube Tungsite: Also excellent for severe abrasion. Use where a rough cutting edge is needed, as in earth or rock cutting tools.

AMSCO Tungsite Bulk Metal: For high abrasion resistance where welding with above electrodes is not practical.

Write today for catalog and prices!

AMSCOATING can make old Tractor Drive Sprockets last 3 times longer than new.

Here's another way to beat the high cost of replacements, down-time and maintenance . . . AMSCOATING the teeth on Tractor Drive Sprockets. Time after time service records have shown that AMSCOATING of sprockets results in these dollar-saving advantages:

1. ***On an average — 3 times the service life of a new, unhardfaced sprocket.***
2. ***2 out of 3 sprocket changes completely eliminated . . . far less down-time, less maintenance . . . more equipment out of the shop and on the job.***

To top it off, sprocket replacements can practically be eliminated. An AMSCOATED sprocket can be reclaimed over and over again . . . *at about half the cost of a new one!*

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a large ready-mix plant: "Having used Ayr-Trap for the past four years with very satisfactory results places us in a position to recommend it to all ready-mix concerns."

a concrete block company: "We heartily recommend Ayr-Trap. The quality of the block is much improved and the appearance much better. The whole operation in making the blocks is easier."

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a mining company: "We are firmly convinced that the use of Ayr-Trap makes a much more workable concrete, that stripped work has a much better appearance with a much greater resistance to damage from freezing."

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for heavy concrete construction

Ayr-Trap can be added at batching plants or on the job. It makes concrete more durable, increases its plasticity and minimizes segregation and bleeding. Increased plasticity with Ayr-Trap insures better placement of concrete in and around closely spaced reinforcing bars. Ayr-Trap develops high resistance to moisture absorption and attack from freezing and thawing forces.

road building

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- Used in liquid form as follows:
  3 liquid ounces per cubic yard of 5 or 6 bag mix.
  1 pint for 5 cubic yards, 6 bag mix.

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The World's Leading Truck Shovel

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"QUICK-WAY," the original truck shovel and always the standard, has for 30 years demonstrated its versatility and adaptability, as well as its superb engineering and long lasting construction — not only in the United States but in 65 foreign countries as well.

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2 Its variety of uses keeps it busy every month of the year.

3 It gets around without haulage equipment—covers up to 100 miles in a day.

4 It costs less than half as much as many pieces of maintenance equipment.

5 It needs only ONE MAN to perform its many jobs.

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Firestone

OFF-THE-HIGHWAY TIRES

THAT'S right! You increase yardage and profits and reduce operating cost when your equipment rolls on Firestone. That's just what the Firestone Earth Mover All Non-Skid tires are doing in the illustration above. This tire is engineered and built for free-rolling wheels — for scrapers, wagons, and buggies — equipment on which maximum flotation, frictional traction, and low rolling resistance are essential. And it holds on slopes without side-slipping.

Firestone Tires stand up longer because they are *built for the job and they are built to take it.* Extra tough, heavy treads give more traction under all conditions. Gum-Dipped rayon cord bodies are reinforced with four extra impact plies and can be retreaded again and again. Tough sidewalls are double-thick and snag-resistant.

Whether it's earth moving, strip mining or rock work, Firestone has the tires and the service that will cut downtime and keep men and equipment on the job. Try them and see for yourself.

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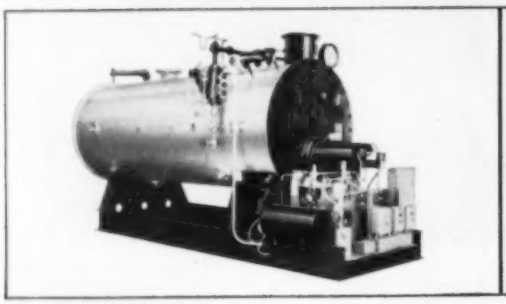
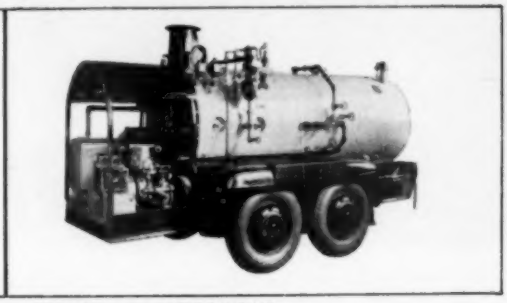
Steam Hot Water or Heat ..

.. at Low Cost for every yard need

CLEAVER-BROOKS SELF-CONTAINED STEAM BOILERS





STATIONARY:

Profitable, uninterrupted yard operation in cold weather calls for steam — hot water — or heat — for many purposes:

- *thawing and heating aggregate in stock piles or bins for cold weather concreting
- *heating water for central mixing plants
- *steam or hot water for cleaning machinery-heating offices and buildings

To provide steam for every yard need — fast, dependably, and at low cost — you will find it pays to equip with Cleaver-Brooks — stationary, self-contained boilers that operate at a guaranteed efficiency of 80% — burn gas, oil, or combination gas and oil — fully meet all codes — standard models available in sizes 15 to 500 hp., 15 to 250 psi. Write for bulletin on Cleaver-Brooks steam boilers.

MOBILE or PORTABLE:

Cleaver-Brooks self-contained mobile or portable boilers are available as trailer or skid-mounted units for:

- *asphalt plant installations
- *heating oils, bituminous materials in tank cars and storage tanks
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Oil-fired — rapid starting — steam in 30 minutes or less. Heavy duty built. 80-125 bhp. — capacity: 2760-4300 lbs. steam per hour (212° F.). Constant steam pressure through automatic low and high fire control. All-year, all-season usefulness. Write for bulletin and complete information on Cleaver-Brooks mobile or portable steam boilers.

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Adams

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Here's the NEW Thor Clay Digger

30% More Power!

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- *Choice of FIVE Chucks:*

BUY IT from your DISTRIBUTOR

Yes, Thor FIELD TESTED the new No. 16 for three years before putting it into production. And when Thor engineers found the demands of tunnel contractors in various territories conflicted—Thor incorporated *all* the demands in one tool giving the user option of INSIDE OR OUTSIDE TRIGGER, CLOSED OR LATCH RETAINER, choice of any of FIVE CHUCKS with only one part change! . . . YOU NAME IT!—THE NO. 16 HAS IT!

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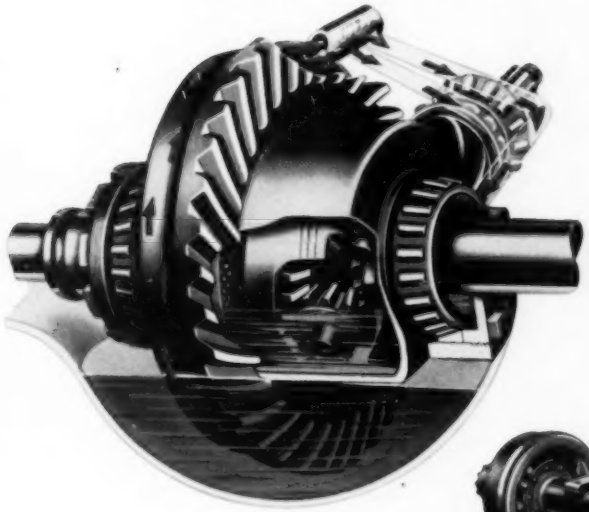
exclusive forced-flow lubrication keeps Eaton 2-speeds on the job, makes them last longer



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PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

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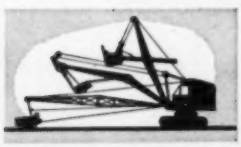
Lift or dig a bigger profit chunk

with LINK-BELT SPEEDER's super ¾ yard shovel-crane

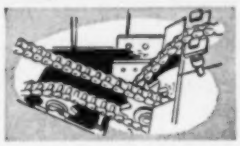
Here's the power and stamina it takes to work in rock and other stubborn material. This rugged LS-85's massive all-welded construction, ground-hugging stability and fast operating cycle keep output and profits at a peak.

Here are other Link-Belt Speeder PLUS FEATURES that work for you



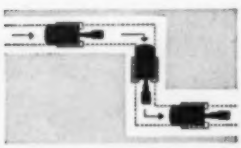
Convertibility — designed for peak production as shovel, crane, dragline or trench hoe. Convert in field—quickly, easily.

All-Welded Lower — extra strength without extra weight. Resists impact and twist. Field service simple, fast.

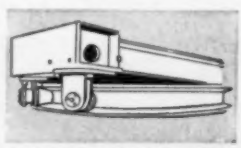


Independent Chain Crowd — is fast and positive. Self-adjusting to all boom angles. No cables to break, slip or adjust.

Self-Cleaning Crawler Treads — eliminate compacting. Track shoe lug meshes with pocket in the drive wheel—ejecting material.



Turns on a Dime. Either track can drive or be locked independently. Digging lock controlled from cab.



Hook Rollers — Cone-shaped for *true* rolling. Reduce roller and roller path loads—eliminate center pin pull.

High Ground Clearance — eliminates snagging or fouling in rough areas. No projecting castings or easily damaged parts.

Service—fast, efficient. Link-Belt Speeder Service is nation-wide—near you with replacement parts, factory-trained mechanics.

LINK-BELT SPEEDER
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Builders of the most complete line of shovels, cranes and draglines
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10,704

Precision Action

CLEANS DITCH BOTTOM WITHOUT DESTROYING SODDED SLOPES!

HERE'S HOW a major railroad uses one of its several Gradalls to cut costs on a rather routine—but never ending—job.

With extreme accuracy, the Gradall cleans this 7½ foot drainage ditch without harming sodded slopes or disturbing the surrounding area. Completely replacing the hand labor previously required, the Gradall did the job quicker, more accurately, and at less cost.

Many similar excavating jobs—close to curbs, sidewalks, tree lawns, buildings, or around buried pipe or tanks—ordinarily require hand work in addition to machines. But the Gradall's positive down pressure and arm action insures such accuracy and neatness that hand labor is eliminated on nearly all such jobs.

The Gradall's remarkable precision, versatility, and maneuverability return big profits to construction men—cut costs for railroads and municipalities.

Gradall
DIVISION OF WARNER & SWASEY Cleveland

Gradall Distributors in over 60 principal cities in the United States and Canada

The 6 ft. wide, ½ cubic yard bucket starts its precision cut.

The hydraulic boom, working with the skill of a giant arm, takes a skim cut from the bottom of the back slope. The muck is cleaned from the bottom, and a skim cut taken from the lower end of the front slope—lifting it free without disturbing sod.

The Gradall swings around and wastes the muck.

The arm-action boom levels the waste evenly over the surface before returning for another cut.

GRADALL—THE MULTI-PURPOSE CONSTRUCTION MACHINE *with Controlled Down Pressure*

ROADS AND STREETS

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Dumping Bridge, Paired Screeds

Help Pave Turnpike's Longest Bridge

How Johnson, Drake & Piper placed concrete deck on 6,950-foot 6-lane Passaic River bridge of New Jersey Turnpike. Truck mixers, specially fitted tower, power buggies and radio telephone also factors in completing job in time for Turnpike's January 15 opening.

By Dan S. Brock

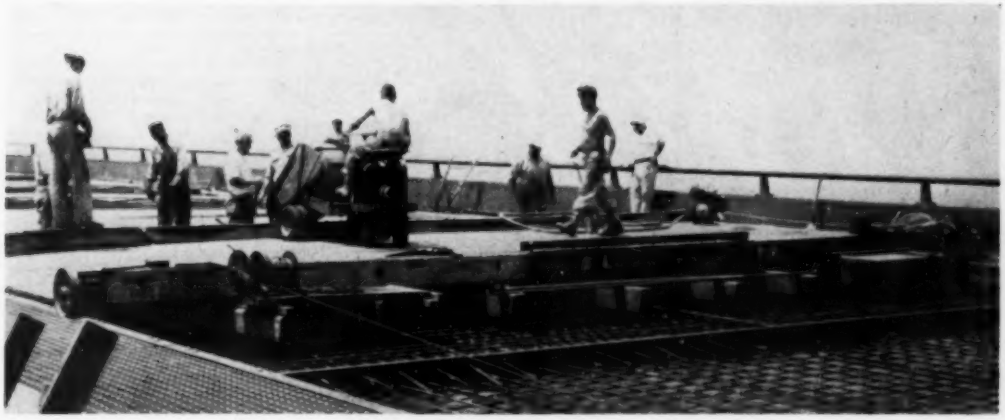
Project Manager, Johnson, Drake & Piper, Inc., General Contractors, Newark, N. Y.

DECK construction on the New Jersey Turnpike's Passaic River Bridge in Newark was quite a problem for several reasons. Special finishing methods were required to place the 36 ft. wide roadway slabs in a single operation, as permitted in specifications. The deck, which rises to 120 ft. elevation above the ground, was accessible to workers only by temporary stairs during most of the job. Concrete, reinforcing steel and form materials had to be hoisted largely by tower or "Chicago" boom. The marshy ground traversed by the bridge, heretofore good only for ducks, was stabilized with a sand gravel fill under the substructure contract, to provide limited ground access. And the contractor had to meet a stiff time schedule, accentuated by delays imposed by late steel deliveries for the superstructure contract.

8 Lane-Miles

In carrying out this job the deck contractor, Johnson, Drake & Piper, Inc., of Minneapolis and New York, used interesting methods herein briefly described. The $1,225,000 contract included 55,600 sq. yd. of reinforced concrete deck slab of 6.75-in. normal thickness. The deck paving consisted of two 36 ft. wide 3-lane slabs, separated by a 6-ft. steel grating covered, raised center mall, and flanked by two 3-ft. grating surfaced sidewalks and a steel parapet and handrail. The gratings gave way to steel plates over rail roads, streets or utilities. The deck, noted in the accompanying cross section, is crowned along the inner lane of each roadway on tangents, with both roadways on a flat super-elevated cross-section on the long sweeping curves of the approaches.

Deck forms consisted of plywood covered wood panel frames supported on the lower flanges of the steel stringers (see sketch and photos). About 110,000 sq. ft. of forms were re-used 4 or 5 times to complete the 500,000 sq. ft. of deck. Forms were largely fabricated at a portable wood-



★ General view of the dumping bridge used by Johnson, Drake & Piper, Inc., in placing deck concrete for the Passaic River bridge

★ Concrete buggies traveled along the sidewalk grating to the dumping bridge

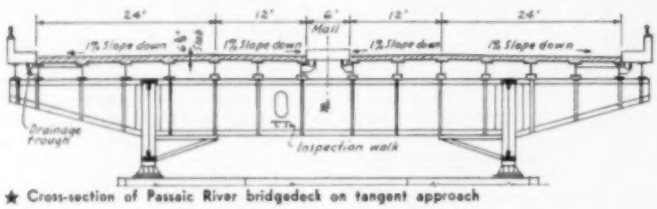
★ Truck mixers dumped into a 5 yd. receiving hopper at the base of the tower

working depot on deck. As a safety measure the 6-ft.-wide form panels immediately adjacent to the center mall were built well in advance of the remainder of the work, to afford a safety walk for workers.

Concrete for the deck was supplied under subcontract by Harrison Supply Co., of Harrison, N. J. Materials were dry batched from a central plant, delivered in truck mixers, and mixed the required time after arrival at the job, after the specified mix water was added at the site.

Concrete was raised to the deck in a heavy-duty tubular steel hoist tower, equipped with a 5-yd. receiving hopper on the ground, a 34 cu. ft. skip, and a 1½-yd. dumping hopper and chute on deck. Two such towers were employed, one on each side of the river, each tower being also equipped with a "Chicago" boom mounted on one tower leg for hoisting reinforcing steel and form materials.

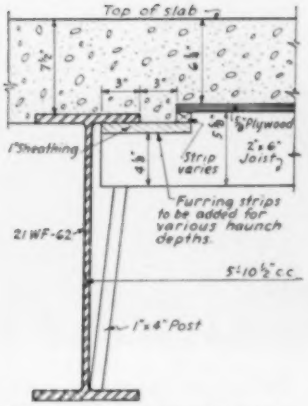
Concrete was delivered from the tower in ½-yd. power buggies (Whiteman), averaging six buggies. The full 36-ft. roadway width was concreted at one time by dumping the buggies from a special 13-ft. wide by 36-ft. long, form-rail mounted timber dumping bridge, struck off and spread by Master vibrating screeds, drawn by hand. Hand finishing included the use of a 16-ft. longitudinal screed to meet the rigid specification surface tolerance of a maximum variation of



★ Cross-section of Passaic River bridgedeck on tangent approach

★ Power buggy receiving concrete from tower, equipped with a special chute and dumping hopper

Editor's Note. The New Jersey Turnpike engineers have described the Passaic River Bridge and the adjoining Hackensack River Bridge as being the smoothest riding of any of the 263 bridges on the project. While the methods and equipment went far toward assuring a good deck job for the Passaic bridge, here described, the major credit lies in the close and friendly cooperation between contractor and engineer personnel in the field. The inclusion of a steel "grade angle" at either edge of the deck slab is a structural detail deserving of much credit for helping assure a smooth strike-off and finish. All the finishing bridges as well as the dumping platforms were supported on wheels resting on the "grade angles."



★ Detail of form construction, designed for easy removal and re-use of panels

★ Showing how two vibratory screeds overlapped slightly were used to finish each 36 ft. roadway. Dumping bridge seen at right

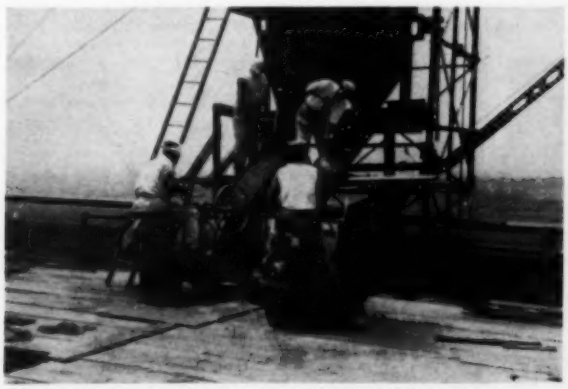
★ General view of the 6950 ft. Passaic River Bridge showing deck partly concreted and steel work still in progress

⅛ in. under a 16-foot straightedge.

The dumping bridge, designed and built by the contractor, consisted of lightweight steel Ceco bar joists, spanning the 36-ft. width as a support for 2 in. planking on 6" x 8" deck forming and a dumping rail. A 2-ton hand winch on either end was used to move the bridge along, this power being required since much of the deck was on a 3% uphill grade.

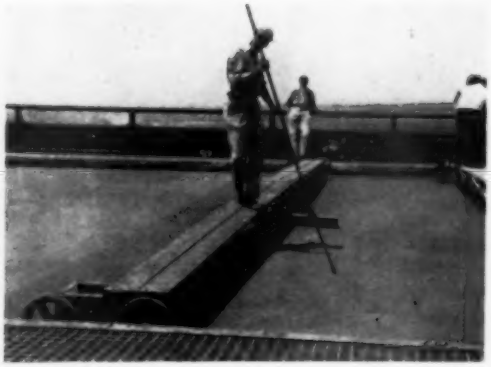
Vibrating Screeds Used

While a dumping bridge was constructed for each side of the bridge, only one concreting outfit was used, the screeds and finishing bridges being moved back and forth to fit the pouring with steel erection schedules. Two Master screeds together spanned the entire 36 ft. When finishing on tangent, a 12 and 24 ft. strip were thus finished, using 14 and 26 ft. stock length screed units with small overlap; when on superelevated flat sections, 18 and 18 ft. widths were finished using two 20 ft. commercial screed lengths. In either instance the outer ends of the screeds were supported on a grade angle, and at the inner ends on a temporary screed rail. This rail was supported by adjustable screed chairs welded to stringers and

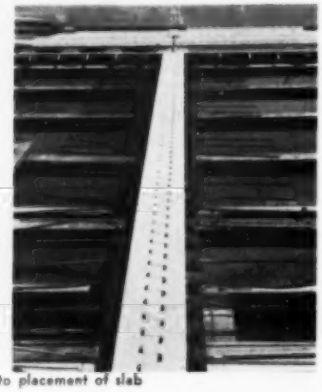


★ Tower and chute proved to be a successful method of delivering concrete on deck

★ Looking down a typical finishing operation, with dumping bridge in the foreground and three finishing bridges trailing



★ Longitudinal float and broom drag were the principal finishing operations



★ Two types of joints in the deck, seen prior to placement of slab

taken up out of the concrete in sections immediately behind the screed operation.

Concrete was internally vibrated when necessary at the engineer's direction, using Master or Mall vibrator units.

The concrete was then floated with long handled wood floats, broom dragged transversely from a finishing bridge, using long handled brooms, and cured by hand application of Clear Cure liquid curing compound. Three form-mounted finishing bridges were used for these operations including necessary edging and troweling.

The job was paced usually to complete one or more bridge spans the full 36 ft. width per working day, involving 100 to 200 cu. yd. of concrete. For the 41 approach spans, no restrictions were imposed on the sequence found most advantageous by the contractor, who fitted his schedule with the steel contractor's. In the case of the five river spans, which involved exceptionally long girders (220', 275' and 375', the latter U.S. record length) the engineers required that both roadways be concreted simultaneously, in order to avoid unbalanced loading.

Reinforcing steel totaling 1500 tons was trucked in on flat-beds over a construction road, and hoisted by the Chicago boom, or by truck crane for end spans close to the ground. Once on deck, steel was transported by dollies via the center mall with power buggies supplying the motive power.

Water for washing forms and concrete equipment was pumped into a 1,000-gal. tank on deck, and supplied via a 2½-in. pipe line laid along the sidewalk.

Stripping Methods

The stripping scaffolding was raised from the ground by four hoist lines, one on each corner. Two lines were raised by winches on stationary trucks, and two simultaneously with hand hoists.

Forms were stripped working from a 20' x 32' stripping scaffold suspended from the steel stringers. From

★ Showing how the stripping scaffold was suspended from anchor hooks

★ This pressure tank and pump were kept on deck for use in washing forms, cleaning out concrete carts, etc.

this scaffold workers changed hangers, working from ladders and a secondary higher, smaller scaffold hung on hanger rods from the steel stringers. Stripped form members were passed up to the deck via the grating openings at the center mall, for re-use or disposal, while the plywood was lowered to the ground by a Beebe hand hoist.

In anticipation of late-season completion, provision was made for cold-weather protection of the concrete. Insulation of the under side was supplied by 25/32 in. Flintkote insulating board, laid on nailing strips attached to the wood form joists near the base, thus giving about 4 in. of dead air space. On top, burlap was laid, followed by 6 in. of loose hay and a tarpaulin cover. These provisions were put to good use in the latter weeks of the job, which still had about 10% to go on December 1 with the last pour made Dec. 22.

The deck pouring job was greatly expedited by the use of radio telephone (Motorola) equipment. The contractor utilized a stationary unit in the field office near the job, a mobile unit in the superintendent's car, and a unit on each end of the job on deck. As it was, the isolated, high level work required considerable stair climbing, by supervisors, but nothing like the amount of lost motion that would have been entailed without radio equipment. About 60% of the time, workers had access to the deck only by means of a tubular steel framed staircase erected by the contractor.

The Passaic River Bridge was designed and supervised by Ammann & Whitney, Consulting Engineers, New York, who served as Section Engineers (bridges) for Section 6 of the Turnpike. Milton Brumer was project engineer; Royton F. Wheadon, resident engineer; and Frank Barker, assistant resident engineer. Johnson, Drake & Piper's organization included Dan S. Brock, project manager; George Daniels, superintendent; Danford Sawyer, ass't. supt.; Hugh Willis, job engineer; and Karl Stricker, office manager. Charles M. Noble is chief engineer of the New Jersey Turnpike Authority.

"We Can Handle Bigger Highway Job Volume"

—*Said AGC Members at Detroit*

Construction volume which reached $30 billion in the U.S. last year, with another $9 billion plant maintenance, will hold to a level slightly below this peak in 1952. So the predictors informed the 1,000 delegates who attended the Associated General Contractors annual convention at Detroit, February 25-28. Steel restrictions will be lifted, said Frank R. Creedon, assistant administrator for facilities and construction, National Production Authority, who promised that "from now on commercial construction is going to get more favorable consideration in the distribution of critical materials."

The outlook, however, is for somewhat reduced housing and building construction, with greater demand for the contractor's services on the heavy types of jobs.

Defense construction will be stepped up, with $3.6 billion in projects scheduled during the year. Lt. General Lewis A. Pick, Army Chief of Engineers, and Rear Admiral Joseph F. Jelley, Chief, Bureau of Yards and Docks, were among the speakers.

Two afternoon sessions were held by the AGC Highway Contractors' Division. A. C. Clark, deputy commissioner, Bureau of Public Roads, Washington, D.C., was a speaker. A panel on current problems will be covered in a later issue of ROADS & STREETS.

In his national staff report, A. N. Carter, AGC division manager, noted the very large back-log of needed highway construction which totals 40 to 50 billion dollars. Also he observed the growing public mood to finance larger road construction programs during the next several years. Other kernels of fact in his report:

Several federal aid bills are before Congress. At hearings recently AGC leaders testified that member contractors reported capacity to carry on at least 50% more highway work than was handled last year.

State highway financing is increasing gradually. During 1951 eight states raised the gas tax rate (making 31 states since 1945), and ten states increased vehicle registration fees. Diversion of road funds to non-road use continues to be a serious matter—8% of all road funds or $217 million thus lost in 1950. States with anti-diversion amendments however have been increased to 31.

Costs of highway construction continue to rise, the composite-mile index increasing in the 1952 fourth quarter to 166.7, up 1.2% over the third quarter and comparing with 145.7 for 1950. The common excavation index decreased 4.6%; concrete paving increased 4.1%.

The Joint Committee of AASHO-AGC held several meetings during 1952, making progress on committee subjects which include: more comprehensive long-range highway plans; more contract maintenance; improved specifications and awarding procedures; improved public relations on highway matters; use of termination clauses in highway construction contracts; increased road financing; greater supply of engineers for road work; better pay for engineers; and improvement in the steel supply for highways.

Five states passed special laws during 1952 to legalize contract termination clauses, while 16 states adopted such clauses without need for legislation. (*Continued on page* 76)

★ Arch Carter, manager AGC Highway contractor's div.; F. W. Heldenfels, Jr., Heldenfels Bros., Corpus Christi, incoming chairman; E. J. Maupin, Jr., Dodge Construction Co., Fallon, Nev., retiring chairman; C. A. Hathaway, Illinois Division of Highways, co-chairman, AASHO-AGC Joint Cooperative Committee

★ AGC officers—C. P. Street, of McDevitt & Street Co., Charlotte, N.C., 1952 vice-pres.; A. S. Horner, A. S. Horner Construction Co., Denver, Colo., president-elect; Glenn W. Mason, Mason Construction Co., Dayton, Ohio, retiring president.

EDITORIAL

New Hope for Adequate Highway Programs

In these times when two miles of highway is being worn out for every one rebuilt, highway department leaders have sometimes been gloomy. But the long-range outlook is brightening. And things are looking up even for the more immediate road programs. Some of the circumstances leading to a growing optimism are worth noting.

First is the news that restrictions on steel are likely to be eased. Ample steel for foreseeable highway needs is expected before the end of 1952, according to J. A. Ingwerson of Armco Steel Corporation. Highway departments have been urged to get their plans completed for urgent steel-using jobs, so as to be ready with a good backlog. Also they should request their full complement of steel for the third and fourth quarters of 1952. Some departments, for reasons of discouragement or because attention has been turned to other types of projects, requested less steel for the second quarter than was allocated to them in the first—an unfortunate circumstance, since allocation is based on a percentage of requested tonnage.

Public Interest Sharpened

The stoppage of vital projects because the highway programs were given such a low rating in Washington, has reacted in our favor in one sense. The steel controversy landed the nation's road plight on page one. Also, the public has been aroused by such things as seeing bridge piers sticking up into the sky, awaiting deck steel month after month while traffic snarls continue. The "underdog" treatment of roads by Washington has fanned public interest in roads to a new high.

Which brings us to a second reason for new highway hopes. A national good roads movement was formally launched in February by two score industry and road user groups. This push promises to have a terrific impact on the public. Already showing its force through preliminary campaigns by Goodyear, Ford, Firestone, General Motors and others, the effort will soon expand into every community. It is a carefully blueprinted campaign. Here at last the motorist has found a voice. According to Arthur C. Butler of the National Highway Users Conference this uprising by many organizations is aimed at "enlisting public support for correcting the mounting inadequacies of our highway system". Biggest such movement since the historic "Get Out of the Mud" campaign of the 20's, this one will carry the banner, "Better Roads for a Stronger America".

"Sufficiency," New Word

A third development will inevitably help assure more adequate road progress. This is the emergence of scientific methods for appraising highway needs. The Sufficiency Rating System, developed and thoroughly tested by Bureau of Public Roads engineers, is the most effective procedure yet devised for promoting public and legislative understanding of the over-all highway needs of a state. The system is an outgrowth of state-wide studies made by the Automotive Safety Foundation and others, most notable being the California study which resulted in a greatly enlarged road program for which citizens are now grateful. The Sufficiency method is being used currently in assaying the needs of the entire Federal-aid primary highway system, to gather facts requested by the President.

These facts will undoubtedly impress congressional leaders, who have already begun hearings on bills to extend federal highway aid into 1954 and 1955. Congress should consider nothing less than the $810 million annual aid recommended by the AASHO. Uncle Sam might then sleep with a less troubled conscience, since he is now taking nearly five dollars from the motorist in the form of federal excise and gas taxes, for each dollar he passes back in highway aid.

Growing public concern over roads, and a snowballing mass of data on what dilapidated roadbeds are costing us economically, should also impress state legislatures. This is an off-year for most of them. Which is fortunate. Their highway committeemen have all this year to take a long, hard look at the road picture in their respective states.

Contractor vs. Paving Quality

Contractors have been loud in their demand to be given "result" specifications, rather than be told how to do their work in every detail. The contracting fraternity has come a long way toward earning the confidence of engineers, which is a necessary preliminary to enjoying such freedom.

Yet how many contractors are really concerned over the quality of their work, other than doing it well enough to get by? Contractors have developed great skill and acumen in their job performance, and if they were so motivated could make a greater contribution to the technology than they do.

The editorial pages of ROADS AND STREETS *circulate nationally to highway, street and airport engineers, and to highway and heavy construction contractors; also to national and state legislative members on highway committees, and other leaders concerned with roads.*

Hence it was refreshing to the editor the other day to visit with a contractor who is concerned with doing a definitely better job—of beating the inspectors to the punch and if possible going their requirements one better. This contractor, a leader in his state on paving work, sent his foremen and superintendents out this spring, with orders to go over every inch of the paving they put down last year. The trips were planned during the early season when winter shop overhauling had been completed, and while the men had time for the assignment before the spring push on new work could get going.

Their order was to note every defect of surface or unevenness in riding quality, report the nature and frequency of these defects, however slight, and to give a written report. This report was required to state why, in the observer's opinion, the defect occurred, and what should be done in the future to see that it doesn't occur on similar jobs. No reflection was cast on the highway department's inspection here. The contractor assumed what any realistic engineer knows—that an exceptionally hard northern winter will show up defects in the best of new paving jobs. The inspection was made without highway department help, although sometimes the men were accompanied by qualified material or equipment supply representatives.

This type of back-checking should pay off for all concerned. It will help the foremen and superintendents to develop into better men, with a riper judgment on the "why" as well as the "what". Having job managers of this kind means fewer wrangles over inspection with attendant delays, more efficiently run jobs, more profits —and more pride in a good job.

This contractor also realizes that the type of paving he specializes in has to compete with other types, and that long run durability and good riding quality are things that can't be bought merely by writing a tough specification and hiring plenty of inspectors. It takes teamwork between engineer and contractor.

Long-Haul Highway Freighting

The 65th Annual Report of the Interstate Commerce Commission states that long distance highway transportation of freight is increasing constantly. The average length of haul on the lines of individual Class I intercity motor carriers increased from 177 miles in 1945 to 218 miles in 1949, while the comparable railroad average decreased from 241 to 229 miles.

One long-distance motor carrier with an average haul on its own lines of 1,573 miles, reported that 52% of its freight moves beyond its lines and another carrier of comparable size reported that 61% is interchange freight.

Standardization of equipment has increased in the past year to facilitate the interchange of trailers, thus permitting the through movement of freight over connecting lines without unloading at the interchange point. It is estimated that betwen 600 and 800 motor carriers now are engaged in this practice and the number is increasing rapidly.

The Commission notes that the longest hauls are between the midwest and the west coast and that this may be due partly to the fact that the rates of motor carriers on transcontinental traffic generally are lower than rail rates. However, there is also a large volume of long-haul traffic by motor carriers between northern and southern points where such rate differential does not exist generally.

Quick Facts—Why a Stepped Up Road Building Pace Will Benefit Every Citizen

Vehicle Registration is up 50% since 1934—growing 5% to 10% yearly—52,000,000 today, exceeding 1960 forecast of road planners.

Traffic Volume doubled in a decade—500 *billion* vehicle-miles of car and truck travel expected in U.S. this year.

Trucking is the new giant industry. Truck travel now 2½ times the 1936 mileage—trucks carry 4.3 times the freight ton-mileage today compared with 15 years ago. Over 9 million trucks in use; over 5 million drivers, nation's greatest single job source. Inter-city and long-haul trucking growing phenominally. Hundreds of commodities hauled 75% to 90% by truck.

Automotive Industry and highway transportation support one-seventh of U.S. economy.

Road Systems deteriorating steadily with 43,000 miles of roadbed on federal-aid primary, secondary and urban systems wearing out each year, while only 19,000 miles rebuilt in 1950. Only 16,900 miles rebuilt last year, due to steel restrictions. Two-thirds of this system mileage of 664,000 miles (20% of roads carrying 80% of rural traffic and linking the nation) is below "tolerable standards" of safety or traffic adequacy—we're 32 billion dollars behind in improvement of this system alone.

Road Programs are less than 50% of requirements to keep pace. Reason: inflation, plus accelerated deterioration, plus slowness of rise in fund sources, never adequate since the 20's. 1951 road construction totaled $2,685,000,000 for all road classes, including $835,000,000 on federally aided projects. About $1,400,000,000 yearly spent to maintain roads, and this cost rising.

Funds Needed: $8 to $10 billion annually for roads, instead of present $4 billion combined total, for next decade, as minimum program to advance over-all standard of traffic service.

Legislation Required: overhauling of legal machinery in most states to assure more funds and more efficient use, better traffic planning and control, more efficient highway administration.

Why Enlarged Programs are in Public Interest: Modernization of highways one key to reduction of traffic fatalities otherwise likely to approach *half-million* in next decade. Better roads pay for themselves in reduced cost of motor vehicle operation, lowered distribution costs, stimulated business and agricultural production, community growth, higher living standards, a better life for all. Poor roads will exact hidden tolls probably exceeding the cost of road modernization programs. Thus citizens will pay for better roads whether they have them or not.

Roads and Defense—scores of thousands of defense establishments, arms plants, sub-assembly plants and suppliers are completely dependent on the fluidity and flexibility of highway transport.

IT COSTS LESS TO BUILD GOOD ROADS THAN TO HAVE POOR ROADS

Public Support of Adequate Road Programs Challenges Research Leaders

Research methods must be expanded in the field of public relations, notes chairman Moyer in reviewing the Highway Research Board's expanding activities. Following are excerpts from his annual address at the Board's 31st annual meeting, held January 15-18 at Washington.

By Ralph A. Moyer
Chairman Executive Committee
Highway Research Board of the
National Research Council
Washington, D.C.

OVER the years the Highway Research Board has developed a well rounded program in which all areas of highway research have been fairly well covered. We have made real progress along many lines, but if we were to judge progress in highway research on the basis of the multiplying deficiencies and the intolerable traffic situation confronting highway engineers in all parts of our country today, we would have to admit that we have fallen down on the job somewhere.

Certainly we have made progress in highway technology, as is evident to anyone who drives over the beautifully designed and well engineered expressways, parkways, freeways, and turnpikes seen in practically all states. What we lack are sound and effective programs in highway finance, taxation, administration and accident prevention which the public will support. Many of our unsolved problems are in the field of public relations where the engineer finds great difficulty in adapting research methods to the solution of the problems pressing for an answer. The very nature of these problems is such that highway engineers and administrators should not alone be expected to solve them. However, they should work with other public officials, economists, tax-experts, legislative officials and others who share the responsibility for their solution. Considerable factual information of a technical nature is needed in the study of highway finance and taxation problems. Highway engineers and administrators should provide such information wherever possible, thereby keeping such studies on a factual basis.

I know many of you are aware of the critical deficiencies on streets and highways, the apparently insoluble finance and taxation problems facing all of our states. These matters are so critical and so important that a brief statement in regard to certain salient facts concerning them seems appropriate here, as a possible way of arousing greater interest in the solution of these problems on the part of all committees of the Board and others who can contribute to their solution.

Alarming Deficiencies

At the recent annual meeting of the American Association of State Highway Officials, held in Omaha, Public Roads Commissioner Thos. H. MacDonald reported that the accumulated deficiencies on the U.S. primary highway system now totaled 75,000 miles; that they are growing by from 5,000 to 6,000 miles a year, and that if the multiplying effect of traffic and loads were included these figures could be tripled.

The California Division of Highways recently reported that out of 14,000 miles of state highways in California, 11,300 miles or 81% show deficiencies of one kind or another. The multiplying effect of increased traffic, loads and monetary inflation on highway deficiencies is clearly indicated in the reports of state highway needs in California. In 1941 deficiencies totaled $440,000,000. Five years later, or in 1946, this figure had quadrupled to $1,700,000,000 and a 1951 report shows deficiencies exceeding $3,000,000,000 despite one-half billion in construction expenditures in the 10-year interim. Construction expenditures on California state highways during the past three years have averaged 94 million dollars per year. At that rate more than 30 years will be required to complete the construction required to meet the 1951 deficiencies. This is in a state which the U.S. Bureau of Public Roads reports showed had the highest highway income of all the states in the U.S. in 1950.

Studies of deficiencies on a nationwide basis have indicated that more than 30 years will be required to eliminate *existing* deficiencies at the present rate of construction. On the 37,000-mile Interstate System for which the construction costs are estimated to be 11.3 billion dollars, Owen and Dearing (of Brookings Institution) estimated that it would require about 100 years to complete the job at the present rate of construction.

It is evident from the above that highway income has by no means kept pace with the modern traffic needs. Furthermore, highway tax rates have remained relatively static, despite the fact that a change in price levels alone was responsible for making highway construction costs in 1951 more than double the costs in 1941. Thus, there is a growing gap between the tax revenue collected for financing highway construction and maintenance and the cost of such construction and maintenance. In many states this gap is so great that public officials apparently have given up hope of raising the tax funds to close it. To meet the pressure for the immediate construction of costly high traffic volume facilities, some of these states are now resorting to toll-road financing as an easy way out of a difficult financial situation.

Tolls Not Answer

At best toll road financing has only limited application and should probably be considered as a stop-gap measure which will only postpone the day of reckoning. Today the public is accepting toll roads in the locations where they are used largely because motorists prefer to pay a premium to drive on a modernized toll road than to battle traffic on the narrow jam-packed, high-accident, obsolete free roads and streets. Some very serious questions are raised by the toll road method of financing which is now being widely used and for which legislation has been passed to permit its use in 18 states.

Some of these questions are: What are the long-range implications of toll-road financing? Are toll roads to be considered as premium roads financed by a premium tax which motor vehicle owners must pay on a selected mileage of roads in a given state? Are toll roads to be considered as a part of an integrated system of main state highways, and, if so, will the existing parallel free roads be maintained in their present condition to assure that the toll roads will be

self-sustaining? If the policy of a state highway department is to plan highway improvements on this basis, how many miles in the state system should be converted to toll roads? Must we admit that it is cheaper and more equitable to collect taxes in the form of tolls than by any other form of taxation that can be devised? If this policy persists, is it not true that gross inequities in the charges for the use of highways will exist with the users of toll roads paying 3 to 6 times more per mile in one part of the state than the users of free roads, which provide transportation equally as good as toll roads, are paying in another part of the same state?

The toll roads which are in operation today are in my opinion serving a useful purpose in many different ways. I will name only two: first, the designers and builders have for the most part not been inhibited by lack of funds as has too frequently been the case in the design and construction of free roads. In general the design standards on toll roads are higher and the construction methods the equal of the best used in free roads. A second important advantage of toll roads is that they should bring about unmistakable realization to highway users of the true value of highway improvements of this type and should also indicate the cost per vehicle mile required to provide adequate highway transportation service and the taxes required to make such highways self-liquidating.

Drastic Overhauling Needed

Research studies which I have conducted at various times have clearly shown that the benefits or savings provided by essential present-day highway improvements will pay for these projects several times over, but that the pro-rated annual tax earnings on these projects too frequently do not equal the annual cost of the project. The wide margin between the 2 cents per vehicle mile average tolls and tax paid by highway users on toll roads and the pro-rated tax of ½-cent per vehicle mile paid on free roads clearly indicates that our highway tax program needs drastic overhauling.

The need for overhauling the highway taxation and finance policies in the United States, and of finding a solution which the public and highway users will support, has been apparent for the past two decades but at no time has the situation been as critical as today. A tremendous amount of work has been done on these problems by Committees of the Board, the Bureau of Public Roads, the Federal Coordinator of Transportation and by many other public and private agencies and organizations. At least six theories of taxation supported by a mass of statistics have been presented at various times. Too often, however, these studies have led to a division rather than a consolidation of opinion, and have intensified animosities rather than promoted a spirit of cooperation and a desire to arrive at a reasonable solution for a very complex problem. Apparently the situation will have to be a lot worse before the public, highway users and others concerned will be sufficiently aroused to demand necessary action to solve these problems.

Industry Action Lauded

In recent months there have been indications that we may be approaching such a time since representatives of big industry such as General Motors, Ford, Firestone, Goodyear and the trucking industry started nationwide campaigns of newspaper advertising and publicity in various forms "to urge rehabilitation and modernization of our city and national highway system." This unusual action on the part of industry is most encouraging, and I suggest that the Board give consideration to inviting industry to participate more fully than at present in committee activities and in cooperative research projects which will contribute to the solution of our highway finance and taxation problems.

The need for prompt action in adjusting highway taxes to fit highway needs is all the more urgent since our federal government is also confronted with a similar situation and is grasping at every opportunity to collect taxes where possible. In 1950 federal excise taxes on motor vehicles were $1,608,000,000. On November 1, 1951, the federal gas tax was raised to 2 cents and the excise tax on passenger cars was raised from 7% to 10% and on trucks, buses and accessories and parts from 5% to 8%. Excise taxes collected in 1952 will very likely equal the highway user taxes collected by all the states which in 1950 amounted to $2,600,000,000. Furthermore, the end is not yet in sight since last year the Treasury Department advocated a 3-cent gas tax and a 20% excise tax. If Congress were to approve such a tax increase, it would be a threat to the solvency of our free state-controlled highway systems. Many states would find that they could not raise the taxes to take care adequately of the increasing maintenance costs, not to mention the needs for modernizing their streets and highways.

Unfortunately many states and the organized motor clubs, trucking associations, certain industries and others have contributed to the recent action by Congress in raising excise taxes because these organized groups in these states have in the past insisted on keeping motor vehicle taxes at their present low level. It is difficult to explain why state gas taxes should be as low as 2 or 3 cents in one state and as high as 8 or 9 cents in other states nearby; why registration fees for cars should range from $3 to $24 per year; or for single unit trucks from $10 to $110 and for combinations from $45 to $495 per year. The average user tax for all vehicles is only slightly above ½ cent per vehicle-mile today, while on toll roads with high traffic volumes in their favor an average charge of about 2 cents per mile is required to make these roads self-sustaining. The low taxes now levied in many states are an open invitation to Congress to step in and collect high excise taxes while collecting is good. The states with the low highway user taxes are not only rendering a disservice to all the people in these states by not providing adequate highways and city streets, but they are also postponing urgently needed highway improvements in all states by encouraging Congress to raise excise taxes which will prevent tax increases required for these improvements.

Beware Complacency

This is no time for complacency in regard to these important highway matters. I believe that the majority of the highway departments are doing outstanding work in their technical operations but are failing to meet their obligations where public relations and human behavior are concerned, such as in highway finance, taxation, management and accident prevention on our streets and highways. Even though our highway departments share the responsibility for these obligations with other public and private agencies, that is no reason for permitting the present intolerable situation in all of these matters to continue.

In my opinion the Highway Research Board is in a better position than ever before to take a leading role in solving these important problems through its committees, the Correlation Service and its newly developed program for conducting cooperative research. It is a real challenge to the leadership in highway affairs which the Board has enjoyed for many years. With the help of all here assembled and of the many agencies now working with the Board or who may engage in broad comprehensive research projects with us, I believe that we can meet this challenge.

New Kind of Service Aids Contractors Doing

Business with Uncle Sam

Management specialists perform unique services for construction contractors, engineers, manufacturers, and suppliers engaged under Government contracts

Special to Roads and Streets

GOVERNMENT contracting has grown to such volume and become so complex that those who do business with the Government have been confronted with many specialized problems. Sprung from these circumstances is an unusual specialized service organization whose work will be described here because of its obvious interest to so many ROADS & STREETS readers.

This organization, Contractors Consultants, Inc., of Los Angeles, was launched in 1947 by William T. Snebold who cut his eye teeth with the Bechtel and McCone interests of Los Angeles and San Francisco. Mr. Snebold, who today heads his own staff, began before World War II getting intensive experience in the business management end of domestic and foreign undertakings in heavy construction and engineering and in the aircraft industries.

Organization of the Los Angeles firm was a natural outgrowth of this experience which quickly enabled Mr. Snebold to win recognition as an authority able to save time and money for construction firms, engineers, manufacturers and suppliers plagued with problems in their Government dealings. The company's current work is entirely with referrals by previously served industrial clients, bonding companies, law firms, accounting firms and industrial associations.

Began with Claims

Originally Contractors Consultants dealt only in the application of administrative procedures in the disposition of claims under Government contracts. One such claim, handled for a Western construction contractor's surety, involved a loss of nearly seven figures suffered in the performance of two government contracts. The largest claim approximated $750,000. In less than four months from the date Contractors Consultants filed this claim the Government Contracting Officer found that the contractor was entitled to substantial additional payment under his contract up to the statutory limitation provided for in the contracting law under which the work had been authorized and let.

It has been possible to effect contract price adjustments for subcontractors to Government prime contractors where the prime contractor was agreeable to processing the claim in his name. Such procedure is necessary, of course, because generally there is no privity of contract existing between the subcontractor and the Government contracting agency.

The services of specialized legal counsel are promptly retained by the organization, a California corporation, whenever the work enters a sphere of activity requiring such qualifications. Legal counsel is retained continuously in Washington, D.C.

The firm soon added another service —that of development and production of industrial brochures in such a manner as to achieve maximum effectiveness in the submission of information, known to be pertinent by persons in Government agencies and industry entrusted with the responsibility for determining the relative merits of a group of organizations offering similar services or products. The brochure is essentially a qualification record, as distinguished from the straight pictorial sales piece.

Recently two new services were added. One involves the conducting of industrial surveys for banks and bonding companies prior to their committing themselves for loans and bonds. This service is increasing in importance in view of the current economic situation. Utilization of this service assures bankers and bond underwriters a *current* picture of the applicant's condition, his policies, etc.

More than one person has expressed amazement in finding that Contractors Consultants in some instances represents a firm on a claim matter and simultaneously is, at field procurement offices of the Government and in Washington, D.C., holding out the services of the claimant to the same Government agency for new assignments.

The firm represents certain clients to help them obtain contracts with contracting agencies of the Federal Government, lesser tiers of Government and private industry. Representation is devoted solely to the employment of sales techniques calculated to secure the most favorable consideration. No unethical or unauthorized methods are used or countenanced, and contracts are solicited through proper channels entirely on the basis of the client's merits and his ability to satisfactorily deliver the work or products required by the owner.

Owner Management

Introduction of the second most recently featured service required establishment of a new organizational arm —the Owner Management Division. Here the organization functions as the owner's agent in letting and supervising contracts for new construction required in industrial expansion programs.

This new service involves upholding strictly the owner's interests in (1) securing the most economical contracting services and materials which meet construction requirements and (2) over-all planning of the necessary sequence of classes of work and proper coordination of work to the end that the project is completed on schedule.

Contract Administration

Mr. Snebold feels that it is just as much the obligation of the Government contractor to pursue the administrative procedure defined by his contract, as it is his obligation to perform the physical work under his contract. In this connection, his organization has frequently developed and applied administrative procedures and contract controls for the Government contractor to assure compliance with the contract and agency orders and regulations, as well as applicable statutes, while preserving and safeguarding the contractor's rights and remedies under his contract.

This service, dubbed "preventive supervision," has begun with inception of the work, including assistance in negotiation of the contract, and has

been utilized during the entire contract performance period. Careful adherence to these procedures and controls minimizes disputes and obviates most of the claims and litigation which might otherwise ensue. In the event disputes should arise, and claims consequently grow out of the work, such supervision assures application of appropriate administrative remedies in the disposition of such claims.

Mr. Snebold believes that a decision of the Supreme Court on November 26, 1951 *(U.S. v. Wunderlich et al)*, could leave no doubt in any Government contractor's mind as to the extreme importance of currently maintaining a correct factual record which record is concurred in by the Government Contracting Officer.

The Consultants also assist the Government contractor in attaining maximum proficiency in the administration of his contract through development and installation of practical procedures, methods and systems for management controls, accurately reflecting therein the policies of the client.

In organizing project functions, attention is given to the installation of business methods and systems which are satisfactory for all practical purposes and yet satisfy minimum requirements of the Government agency supervising the activity. Proper business methods accelerate the contractor's work program, eliminate trial and error expense from job costs, make for a satisfied customer in the Government. Emphasis is placed upon procedures to expedite reimbursement of costs.

Project Management

By late 1948 the company found itself providing project management services for bonding companies on finish-up work under fixed price construction contracts where the right of the contractor to proceed was terminated by default. Later it began providing business management services for the construction contractor under the cost-plus-a-fixed-fee system of contracting. In this role Contractors Consultants is responsible to the contractor for management controls, including report, chart and forecast; financial, cost, property, budgetary and stores accounting; reimbursement (a field in its own right); subcontract supervision; procurement; receiving and inspection; warehousing; traffic; equipment rental; inventory control; surplus property disposition; personnel administration; pay roll and timekeeping; contract changes and termination; insurance; employee housing and camp facilities; safety; hospital and first aid; and commissary.

Renegotiation of contracts is, as might be assumed from the variety of services performed, a part of this service picture. A particularly large volume of contract renegotiation, as well as contract termination settlements, is anticipated in the near future. The firm has a successful record in handling negotiations for East Coast concerns, under their instruction, on the West Coast where the sole interests of the Eastern concern must be upheld.

Familiarity with the statute, regulations, directives, opinions and decisions and other data governing the pay of wage earners and salaried personnel has permitted Contractors Consultants to aid organizations in wage-salary problems. In the interest of attaining a stabilized economy, the Defense Production Act of 1950 provided for wage and salary stabilization through Government controls. The author handled a large volume of this work during World War II.

Recently the Consultants announced the availability to the Government of management consultant services, including assistance in inaugurating new or changing methods of procurement and supply; studying, developing and installing procedures, methods and systems for management controls in the administration of contracts; and other functions related to accomplishment of the contracting business of the United States Government—often referred to as the world's largest contractor.

Four States Act to Protect Highway Funds

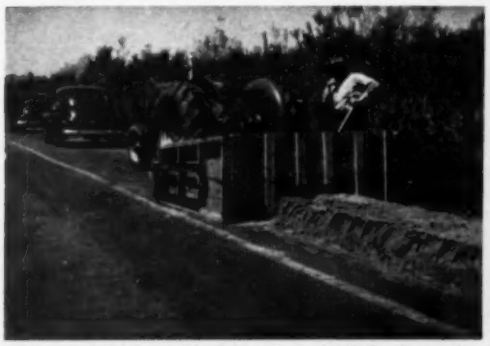
Highway users have renewed their efforts to secure approval of constitutional amendments prohibiting diversion of highway use taxes. Such proposals were recently introduced in the legislatures of Arizona, New Jersey and New York according to the National Highway Users Conference. Twenty-one states already have constitutional protection of revenues.

Highway users in Alabama and Georgia were successful last year in gaining legislative approval of resolutions for anti-diversion constitutional amendments. These amendments will be submitted to the voters in November.

Homemade Windrower

Another job "kink" seen on North Carolina road work some time back was the wooden spreader box pictured here, designed to leave a measured windrow. This windrow strikeoff machine was supplied by an engineer in the maintenance department of the North Carolina State Highway and Public Works Commission. It was being towed by an industrial tractor, which apparently has to be unhooked and pulled ahead in the clear wherever a new truck load of material was dumped in the box, dumping being from the front.

The unit was used for mixed-in-place bituminous retread, and a Woods road mixer followed to blend bitumen with the windrowed material, which was thus struck off at a height and width to provide the desired amount of material per lineal foot.



★ Homemade windrow strikeoff box seen on North Carolina road work

★ In distributing lime it is helpful to shoot the lime and base with a light sprinkling of water before mixing begins, especially when wind is blowing

Stabilizing Weak and Defective Bases

WITH HYDRATED LIME

A test section based on Texas highway experience was built, followed by an extensive post road and street construction program. Advantages have been achieved with commercial lime and commercial lime-portland cement in correcting poor soils and producing dense, high quality bases.

By Maynard G. Fuller and Gordon W. Dabney

Roads and Railroads Branch, Engineer Section, Headquarters Fourth Army, Fort Sam Houston, Texas

EXPERIENCES from field behavior and laboratory tests confirm that sturdy and dependable bases can be secured by use of hydrated lime as a stabilizing agent for highly plastic granular base materials. Army engineers in the Fourth Army Area have converted 797,820 square yards of old highly plastic flexible base materials into dependable bases by using 3 per cent by weight of hydrated lime. The California bearing ratio is likewise improved and increases of 300 to 700 per cent are very common. Lime treatment of old bases usually results in economies and in stronger bases than secured by replacing the old with new, good quality, soil-bound materials.

Maintaining pavements having bases incapable of carrying the required traffic is costly in time, money and efficiency. Many pavements were constructed with sufficient depth and metal, but with the soil binder fraction too plastic. Failures usually occur with the accumulation of moisture, causing the soil binder to lose its supporting strength. Some defective bases have been strengthened in the past by the addition of good quality material as an overlay, while others were reconstructed by removing and replacing with new soil-bound materials. Overlaying is adaptable on range roads or streets through unimproved areas, but in built-up areas, it would often disrupt drainage and make necessary the removal of the old surface and base. Therefore, an economical method of stabilizing the inferior materials in place is very desirable.

Defective bases have been stabilized with lime at eight different installations in the Fourth Army Area to date at an estimated saving of $330,082, which was made possible by utilizing the old materials in place instead of removing and replacing with new. (See Table 1.) The saving, of course, is greater within built-up areas, but in all cases savings have been realized. Work is performed both by contract and by regular maintenance forces. All bases that have been stabilized with lime are now in excellent condition.

Built Test Section

Success of the Texas Highway Department in the field of lime stabilization* inspired Fourth Army Engineers to try a test section at Fort Sam Houston in 1948. Through cooperation with the Texas Highway Department, tests were conducted on samples of the native gravel base from the road selected for the experiment. Results clearly indicated that stabilization with 3 per cent by weight of hydrated lime was feasible. (See Tables 2 and 3.)

The test section was constructed following closely the accepted procedures used by the Texas Highway Department. Motor patrols were used in scarifying existing base, mixing in the lime and placing the mixture. The ease of pulverizing clay balls after addition of lime and water exceeded expectations. During final mixing and placing, the material was very friable and had many characteristics of a non-plastic mix. The base course was compacted at optimum moisture content with a pneumatic roller and opened immediately to traffic. The surface was maintained in a damp condition for the first three days after placement and then allowed to dry out. This test section was used for six months as an open surface road, subjected to fairly heavy traffic including trucks, and to intermittent periods of rainy and dry weather. Very little slush appeared on the surface during wet weather and no soft spots developed. In dry weather some abrad-

*See article "Hydrated Lime for Stabilizing Roadway Materials," by Chester McDowell, Texas Highway Department; Roads and Streets, February, 1949.

ing of the surface occurred. Before placing the surface course, an attempt was made to smooth the base by sprinkling and blading. It was soon evident that due to hardness, this could not be accomplished without scarifying the entire depth of the treated material. Therefore, a seal coat of RC-2 cut-back asphalt covered with very fine pea gravel was placed with the idea that a cold lay asphaltic concrete surface would be applied at a later date. This light wearing course has now been in service for approximately three years carrying heavy traffic without base trouble and without the asphaltic concrete surface.

Important Procedures

Experience gained in constructing the approximately 800,000 square yards of lime stabilization completed to date distinguishes certain procedures as important:

a. Lime stabilization can be processed and finished by the same methods as are applicable for raw flexible base materials when blending is required.

b. Due to the whiteness of the lime, the mixing operation can be judged visually on most bases.

c. Lime should be incorporated in base material soon after spreading in order to prevent wind from creating a dusty condition. Sprinkling the dry base materials before and during mixing operations is also helpful.

d. Lime stabilized materials should be finished to the desired smoothness and maintained as an open surface until the bituminous course is placed.

P.I. Reduced

In 1949, the Headquarters Fourth Army Engineering Materials Laboratory was established at Fort Sam Houston, Texas. Laboratory investigations made through these facilities on materials from failed sections of existing bases revealed much interesting data, some of which are given in Table 4. It is noted from these data that the plasticity indices reduced from a high of 33 to between 8 and 10 in every case when lime was admixed with the material. No plastic materials have been encountered to date in this laboratory that have not been helped by addition of lime; however, it is understood that the Texas State Highway Department Laboratory has had experience which makes testing of all untried materials advisable before inaugurating a lime stabilization program.

Laboratory tests also indicate that the plasticity indices and percentages of soil binder continue to reduce with age. Tests conducted on samples from lime stabilized bases now in service also bear this out. For example, this relationship is clearly indicated in the results obtained by the Texas Highway Department Laboratory and the Headquarters Fourth Army Engineering Materials Laboratory for the clay gravel material used in a large portion of the original pavement construction at Fort Sam Houston, Texas. These data are plotted on Chart No. 1 to show the plasticity index, the soil binder and strength relationship with age. The soundness of the lime stabilization principle is attested by these results.

It is desirable to cure lime stabilized

Table 1—Lime Stabilized Base Placed or Under Contract, Fourth Army Installations July, 1951. Including Cost Comparisons

Station	Lime Treated Base: Date 1st Stab. Base Placed	Lime Treated Base: Total SY Placed or Under Contract	Lime Treated Base: ** Actual Cost Per S.Y.	Lime Treated Base: Total Actual Cost	Flexible Base: * Est. Cost Per S.Y.	Flexible Base: Total Est. Cost	Total: Saving by use of Lime
	(Apr.)						
Fort Sam Houston	1948	318,420	$.31	$ 98,710	$.71	$226,078	$127,368
Camp Chaffee	1949	203,000	.326	66,178	.75	152,295	86,100
Fort Worth QMD	1951	7,000	.31	2,170	.68	4,760	2,590
Fort Sill	1949	126,000	.42	52,920	.90	113,400	60,480
Pine Bluff Arsenal	1949	40,000	.39	15,600	.89	35,600	20,000
Maumelle Ord. Plant	1951	15,000	.28	4,200	.56	8,400	4,200
Red River Arsenal	1950	15,000	.275	4,125	.56	8,400	4,275
Wingate Ord. Dep.	1951	73,400	.53	38,902	.87	63,858	24,979
Total		797,820	$.35	$282,805	$.76	$612,721	$330,082

*Estimated prices used include placing new flexible base material of quality which will meet Fourth Army specification and also the removal of existing base material in cases where removal of existing bases would be necessary due to controlling grades of paved areas. Prices used are in most cases actual bid prices secured for this work from the same contractor and at the same time that bids were received for lime treated base.

**These prices are actual contract bid prices, except for about 5% of the work, which was performed by Post Engineer personnel and equipment.

Table 2—Soil Constant Results, Before and After, By Texas State Highway Department Laboratory

Lab. No.	Liquid Limit: Raw	Liquid Limit: 3% Lime By Weight	Plasticity Index: Raw	Plasticity Index: 3% Lime By Weight	Linear Shrinkage: Raw	Linear Shrinkage: 3% Lime By Weight	Percent Soil Binder: Raw	Percent Soil Binder: 3% Lime By Weight
48-17R	40	38	21	8	13.4	4.5	34	13

Tests were made after seven-day curing period.

★ General view of road at Fort Sam Houston, Texas, prior to beginning of lime stabilization. Note numerous patches and rough surface due to the unstable base (Right): How old asphalt surface looks when scarified

★ Lime sacks are either distributed in the checkerboard pattern and opened for spreading with equipment, or placed in windrows as pictured here. Windrow method is preferred on windy days. The sacks are emptied along the inside slope of the windrows, base material is immediately bladed over the lime and mixing is begun
★ (Right): Pulverizing mixer used in mixing lime with base material at Fort Sam Houston, Texas

bases in a manner similar to that used in portland cement stabilization, but it does not appear that this curing is imperative. Satisfactory results have been secured by keeping the finished surface damp a few days. The asphalt surface course placed as soon as possible after completion of base will provide the necessary curing.

Table 3—Tri-Axial Tests on Specimen with 3% Lime—Laboratory No. 48-17R

	Molding Data			Curing Data Water Content		Testing Data			
Specimen Number	Water % Dry Weight	Dry Den. Lbs. Cu. Ft.	Moist Time Days	After Drying % Dry Weight	After Capillary Absorption % Dry Wt.	Applied Lateral Pressure PSI	Ult. Comp. Str PSI	Strain at Ult. %	Swell Volume %
1	7.9	127.8	14	4.9	9.9	5.6	206	1.03	Negligible
2	10.1	126.5	14	6.4	10.6	5.6	257	1.53	
3	9.0	127.9	14	5.6	10.1	5.6	293	1.16	
4	9.1	128.2	7	5.8	10.1	5.6	244	1.03	
5	9.1	128.5	7	5.7	10.	5.6	261	1.30	
6	9.1	128.1	7	5.9	10.2	10.6	300	1.29	
7	9.0	128.3	7	5.6	10.1	15.6	380	1.42	
8	8.9	128.2	7	5.8	9.9	20.6	415	1.42	

Limit to Lime

Test results indicate that hydrated lime will lower the plasticity index of a plastic material to a certain point, and no more, regardless of the additional amount of lime added. (See Chart 4 for a typical example of this tendency.) It will be noted that 4 per cent by weight of hydrated lime lowered the plasticity index from 31 to 8.5 while 6 per cent decreased the plasticity index to only 8.0. This similar tendency has occurred in all

Table 4—Soil Constants Before and After Stabilization

Headquarters Fourth Army Engineering Materials Laboratory

Station	Location	Liquid Limit Raw	Liquid Limit 3% Lime	Plasticity Index Raw	Plasticity Index 3% Lime	% Soil Binder Raw	% Soil Binder 3% Lime	Completed Base* Liquid Limit	Completed Base* Plasticity Index	Completed Base* % Soil Binder
Fort Sam Houston, Texas	Zinn Road	40	38	21	8	34	15	38	9	18
	S-4 Road	41	40	28	10	30	17			
	W.W. White Road	42	40	25	8	26	15			
	Ord. Parking Area	46	40	33	6	28	14			
	S-2 Road	43	42	26	9	35	23			
Fort Sill, Okla.	Meers Road	33	32	14	8	37	32			
Camp Chaffee, Arkansas	25th Street	36	31	22	9					
	Ft. Smith Blvd.	44	29	30	9	34	32	35	11	17
	W. Hospital St.	36	27	30	8	24	23	31	9	17
	W. Warehouse Ave.	34	29	14	8	24	23	31	6	16
Louisiana Ord. Pl., Shreveport, La.	Pearl Harbor	25	26	14	8	38	35			
	Staff Housing Area	31	29	22	9	42	37			
Fort Worth QMD, Fort Worth, Texas	1st Street	41	40	25	9	36	10	36	11	30
Red River Arsenal, Texarkana, Texas	O.U.T.C. Road	41	40	24	9	26	13			
Wingate Ord. Dep., Gallup, N. Mex.	St. So. Field Office	41	31	30	6	29	22			
Pine Bluff Arsenal, Arsenal, Ark.	Wire Road	36	38	21	10	22	14			
	321 Avenue B.	33	32	15	9	18	10			

*From road after field processing with 3% Lime is completed and base cured.

Method of Processing and Testing

Method of processing samples of raw base was in accordance with standard A.A.S.H.O. procedure. Designation T 146-49; and soil constants were secured according to Standard A.A.S.H.O. procedures. However, in processing the lime admix samples, the following procedure was used:

a. 3% hydrated lime by weight was added to the raw material.
b. Lime was mixed with raw material and then sufficient moisture was added to secure optimum moisture (A.A.S.H.O. T99-42 Modified).
c. Sample was covered and allowed to set for one hour.
d. Sample was compacted in 6" mold to optimum density (Mod. A.A.S.H.O. Method).
e. Specimen was removed from mold and placed in damp room for three days.
f. Specimen was removed from damp room and placed in oven at 160 degrees and allowed to dry.
g. Sample was then processed according to Standard A.A.S.H.O. procedure. Designation T 146-49 and soil constants were secured according to applicable A.A.S.H.O. procedure.

materials tested to date in the Headquarters Laboratory. Lime added in excess of 3 per cent by weight to these base materials having less than 40 per cent binder is unnecessary for plasticity index reduction.

Lime stabilization lends itself readily to repair or reconstruction of flexible pavements. It can be economically used for new construction where the available local materials are unsatisfactory due to high plasticity indices of the soil binders. It is especially adaptabe to city streets, parking areas and other areas where existing bases might otherwise have to be removed before placing new materials in order to maintain proper grades.

CBR Improved

California bearing ratio studies also provide means of evaluating lime stabilization. These studies have been made on soil bound base materials with highly plastic binders before and after stabilizing with hydrated lime (Table 5), also on clay soils without aggregate.

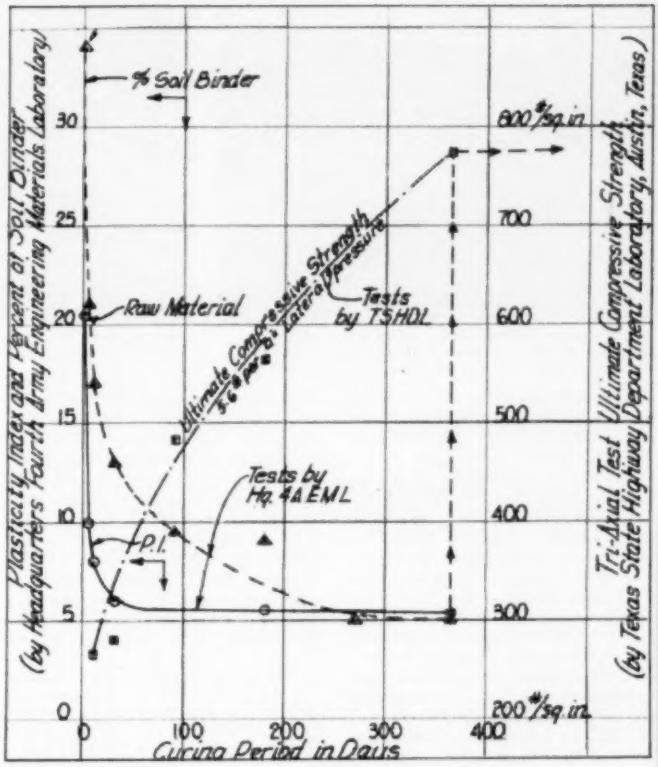
It can be seen from Table No. 5 that lime stabilization materially increases the strength as measured by the CBR method. In fact results obtained from lime stabilized clay soils containing no coarse aggregate fraction and having high plasticity indices before admixing with lime show very high California bearing ratios. Data presented on Chart No. 2 is from a sample of black waxy clay having a plasticity index of 31 and CBR value of 6. When admixed with 4, 6 and 8 per cent by weight of lime, the plasticity indices reduced to from 11 to 9 and the California bearing ratio values increased up to 156. Plans are now under way to construct a test section at Fort Sam Houston, using this stabilized clay soil as a base for an asphalt surface course.

Lime-Portland Cement Stabilization

Non-plastic materials are not materially affected by the addition of lime. Some distressed bases investigated were found to have failed when the soil fraction was so friable that the soil particles did not bond together. Other failures occurred because the soil portion was too great to furnish the desired strength. In many instances these areas are interspersed with areas having the soil portion too plastic to be mixed satisfactorily and economically with cement unless the plastic characteristics of the clay are changed. In order to correct this condition, a hydrated lime-portland cement combination plan has been developed and used very effectively. Lime can be mixed easily with the plastic base materials causing them to become friable permitting the cement to mix readily with the resulting material. All materials, including the non-plastic ones, are hereby bound together into a solid mass.

Lime-cement is also often specified where high base strengths are required and where the soil portion of the material in place is highly plastic. The lime lowers the plasticity index, making the portland cement combine more readily and efficiently with the soil particles.

In this process the lime is added and mixed as in the lime stabilization method described heretofore. The combined material is then permitted to set for a short period after which it is again pulverized, portland ce-


Plasticity Index and Percent of Soil Binder
(by Headquarters Fourth Army Engineering Materials Laboratory)
% Soil Binder
Raw Material
Ultimate Compressive Strength Lateral Pressure
Tests by T.S.H.D.L.
Tests by Hq. 4A E.M.L.
P.I.
Curing Period in Days
Tri-Axial Test
(by Texas State Highway Department Laboratory, Austin, Texas)
Ultimate Compressive Strength
800 #/sq. in.
200 #/sq. in.

★ Chart No. 1. Effect of curing period on Plasticity Index, percent of soil binder, and ultimate compressive strength of base material specimens treated with 3% by weight of hydrated lime

★ This mixer was used on lime stablization contracts job at Fort Sam Houston, Texas. Mechanical mixing cuts blading to minimum. (Right): Base material ready for spreading and compacting

★ Compacting with sheepsfoot roller, which is followed by use of pneumatic and flat-wheeled rollers for finishing out

★ Making field density determination. The larger density bottle is for determination on granular material on bases

ment added, processed and cured in accordance with standard practices recommended by the Portland Cement Associaiton for soil-cement.

The ease in pulverizing, after lime is added, helps offset the extra manipulation required by using two admixtures. Laboratory results of wet-dry tests on specimens made from base materials at Pine Bluff Arsenal are shown on Chart 3.

Approximately 165,000 square yards of lime cement stabilization were completed at Fort Sam Houston in 1950. Results to date are very satisfactory. Some typical transverse soil-cement cracks have occurred but no failures. Table 6 is a summary of lime-cement stabilized base placed to date including cost comparisons.

Equipment Required

Existing bases can be stabilized with lime by use of the following minimum equipment: motor patrol with scarifier attachment, water distributor, pneumatic roller and truck.

On larger projects, the cost of operation can be materially reduced and somewhat better mixing obtained by using special mixing equipment. Following is a list of equipment being used on one lime stabilization contract at Fort Sam Houston, where approximately 120,000 sq. yd. of lime stabilization were accomplished on streets and parking areas.

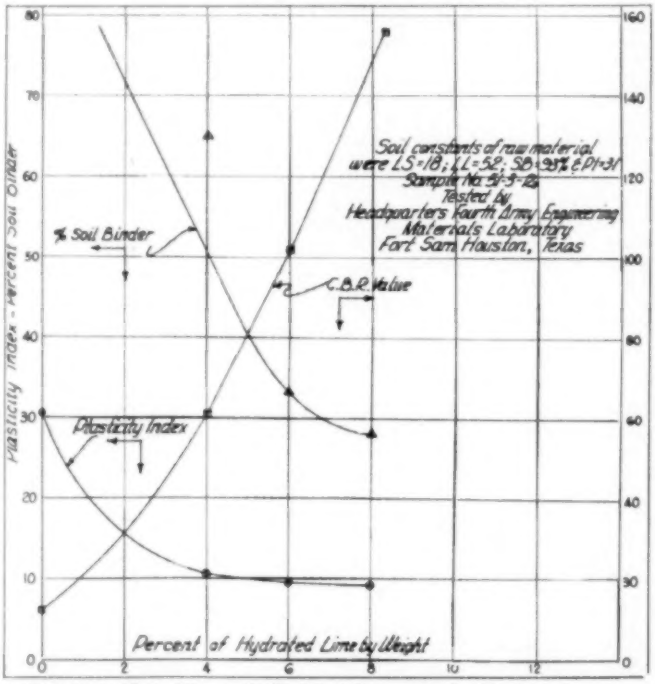
- 2 Motor patrols (one with scarifier attachment)
- 1—1,000 gallon water distributor
- 1 Flat bed truck
- 1 Pulverizing mixer (with friction clutch for each row of teeth)
- 1 Pneumatic roller
- 1 Pneumatic wheeled tractor
- 1 Sheepfoot roller
- 1 Power roller (8-ton tandem)

An average of over 3,000 sq. yd. of 8-in. stabilized base was processed and finished each working day. The contractor estimated that this amount could be increased to approximately 4,000 sq. yd. on rural highways. Additional trucks would be required if the distance that water and lime must be hauled is increased.

The accompanying pictures illustrate the methods used in construction of lime stabilized base at Fort Sam Houston, during the summer of 1950. The road stabilized had been in bad condition, due to numerous base failures which caused a constant maintenance problem. This work was accomplished by Colglazier and Hoff, contractor, under engineer supervision of Colonel W. T. Cathcart, Post Engineer, and Lieutenant Colonel Joseph E. Veale, former Post Engineer, through Mr. V. O. Fritze, Chief of Engineer Branch, Post Engineer Office, Fort Sam Houston, Texas.

Conclusions and Observations

Experience gained in construction and in observation of lime and lime-cement stabilized roads under various degrees of usage and weather condi-



★ Chart No. 2. Effect of lime on the Plasticity Index, amount of soil binder and California Bearing Ratio—a black waxy clay soil. 4%, 6% & 8% of hydrated lime by weight was added to different soil samples and sufficient water was mixed in to secure optimum moisture. Samples were then covered for one hour, molded to secure 95% modified density.

tions together with test results obtained by Headquarters Fourth Army Engineering Materials Laboratory all bear out the following conclusions:

1. Some laboratory investigations should be made before formulating engineering recommendations and estimates of cost for lime or lime-cement stabilization when untried materials are involved. The following information should be obtained.

a. Soil constants and gradation of natural base material before admixing.

b. Soil constants and gradations of trial mixes after admixing the lime into the raw materials using various percentages of hydrated lime (usually 2, 3 and 4 per cent by weight for base material containing aggregate with not more than 40 per cent binder) processed and cured as described on Table No. 4.

c. California bearing ratio and triaxial tests may be made on the raw material and on the stabilized materials if CBR results are desired.

2. Although base materials having plasticity indices between 8 and 45 and soil binder percentages between 15 and 60 have been stabilized satisfactorily with 3 per cent by weight of hydrated lime in this program, occasionally a material is found having characteristics within these limits which is improved only slightly when lime is added.

3. Strengths of lime stabilized materials increase with age after being placed. Also the plasticity indices and amounts of soil binder decrease with age. (Chart No. 1.) Lime-stabilized bases acquire the characteristics of a semi-rigid base. Therefore, these bases should be designed with sufficient depth to prevent imposed loads from causing excessive deflection. Six inches is considered the minimum depth for light traffic. It is especially

(*Continued on page 82*)

Table 5—Comparison California Bearing Ratio Results Natural and Lime-Stabilized Soils

% Hydrated Lime by Weight	** Days in Humid Room	Liquid Limit	Plasticity Index	% Soil Binder	California Bearing Ratio Value
		(Clay Gravel from Pine Bluff Arsenal, Arkansas)			
0	0	40	25	32	17 *
3	3	38	8	24	90 *
		Clay Gravel from Fort Sam Houston, Texas			
0	0	40	21	34	18 *
3	3	38	8	17	82 *
0	0	40	25	36	16 *
3	10	38	8	18	90 *
		Black Waxy Clay Soil from Fort Sam Houston, Texas			
0	0	52	31	93	6
4	10	42	8	65	61 *
4	20	44	9	62	63 *
4	30	43	8	63	79 *
6	10	43	8	33	102 *
8	10	43	7.5	28	134 *
8	20	44	7	30	156 *
8	30	49	6	23	162 *

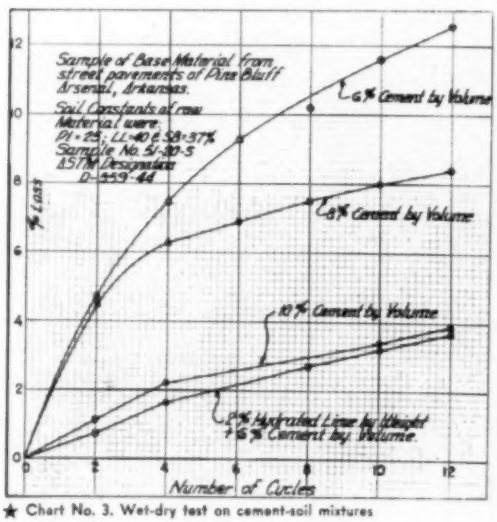
**Time in humid room after molding and before immersing in water for at least five days on CBR tests.
*Average of two specimens.

Table 6—Lime-Cement Stabilized Base

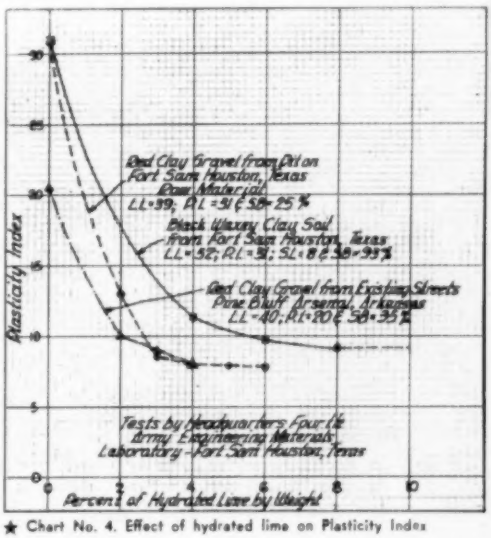
Placed or Under Contract at Fourth Army Installations as of 1 July, 1951, Including Cost Comparisons

Station	Lime-Cement Stabilized Base Date first Lime-Cement Placed	Total S.Y. Placed or under Contract	Cost per S.Y.	Total Cost Bid Price	Flexible Base Estimated Cost per S.Y.	Total Estimated Cost	Total Saving by use of Lime-Cement
		*			**		
Fort Sam Houston	1950	76,000	.51	$38,760	$1.16	$ 88,160	$49,400
Camp Polk	1951	33,000	.59	19,800	80	26,400	6,600
Pine Bluff Arsenal	1951	49,000	.74	36,260	1.18	57,822	21,562
Total		218,000		$94,820		$172,382	$77,562

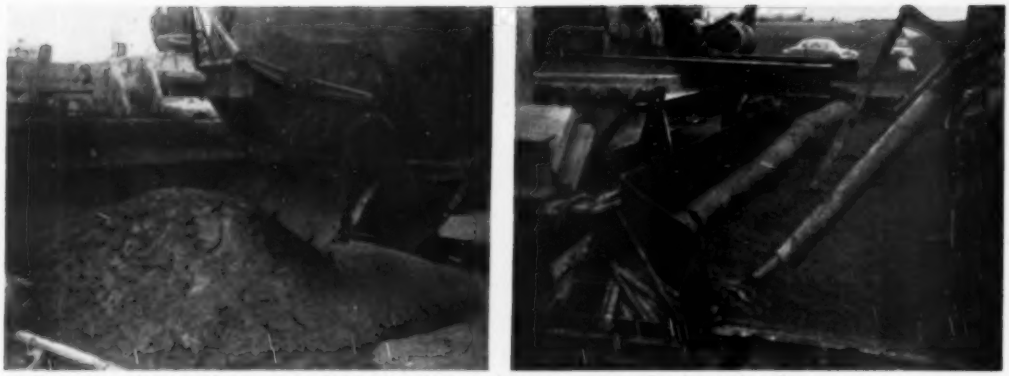
*Six inch depth.
**Ten inch depth.


Sample of Base Material from street pavements of Pine Bluff Arsenal, Arkansas.
Soil Constants of raw Material were: PI = 25; LL = 40 & SA = 37%
Sample No. 51-20-S
ASTM Designation D-559-44
6% Cement by Volume
8% Cement by Volume
10% Cement by Volume
2% Hydrated Lime by Weight + 6% Cement by Volume
% Loss
Number of Cycles

★ Chart No. 3. Wet-dry test on cement-soil mixtures


Red Clay Gravel from Pit on Fort Sam Houston, Texas Base Material LL = 39; PI = 51 & SA = 25 %
Black Waxy Clay Soil from Fort Sam Houston, Texas LL = 52; PI = 31; SL = 8 & SA = 93%
Red Clay Gravel from Existing Streets Pine Bluff Arsenal, Arkansas LL = 40; PI = 20 & SA = 35%
Tests by Headquarters Fourth Army Engineering Materials Laboratory - Fort Sam Houston, Texas
Plasticity Index
Percent of Hydrated Lime by Weight

★ Chart No. 4. Effect of hydrated lime on Plasticity Index



★ These photos show typical appearance of Nebraska's air-entrained concrete containing fly ash, as it drops from paver bucket and rolls in front of finisher

NEBRASKA PAVES WITH

Fly Ash Concrete

Six-mile project completed in 1951 with fly ash admixture, following research program showing value of fly ash in controlling deterioration, related heretofore to reaction of local sand-gravel aggregates with cements used

DURING 1951 the Nebraska Department of Roads and Irrigation built a 5.8-mile section of two-lane concrete pavement, in which 165 lb. per cu. yd. of commercial fly ash was specified in the concrete mix. This project is the result of research to eliminate "map cracking," a phenomenon experienced in some Nebraska concrete road pavements. The trouble is believed to be caused by a reaction between the cements used and the native sand-gravel aggregates of Nebraska.

This type of deterioration, consisting of small longitudinal and transverse crevices in the concrete surface, has occurred on bridges as well as highway pavements. It is thought to be due chiefly to excessive expansion; in some places where the trouble has occurred the concrete has forced all the plastic material out of expansion joints. In others, curbs have been toppled, further indicating abnormal expansion. In the opinion of Nebraska engineers the problem stems from changes in portland cement manufacture adopted about 1930, which, while leading to higher-strength concrete, also seems related to the map cracking tendency.

In 1949 the Kansas Highway Commission built a 5-mile experimental pavement in an attempt to find the best aggregate-cement mixtures.*

Nebraska cooperated by making freezing and thawing tests on beams from the Kansas project. The Nebraska department, as a start toward solving the trouble, had since 1947 specified air entrained concrete and use of 30% of crushed limestone aggregate in p.c. concrete pavements. Formerly a 100% sand-gravel mix was used, since limestone is not found in sizeable quantities in the state, but required importing by rail at high cost.

Test Project Built

Then in 1950 a 6-mile heavily traveled section of U. S. 30 between Fremont and Arlington was set up as a test project, embodying 26 experimental sections containing varying amounts of fly ash, standard portland cement, portland-pozzolan cement, air entrainment and both limestone and native sand-gravel. Dobson and Robinson, of Lincoln, were the contractors. Nine general mixture types were used, including a control section built to the current Nebraska specifications. All mixes were previously laboratory tested, and plans were developed to correlate laboratory data with performance under traffic and weather. The preliminary test work was conducted largely in 1949, this work including tests for change of length, sonic modulus, unit flexural strength, and compressive strength after both freezing and thawing and wetting and drying.

Cores were taken from the finished pavement for future periodic testing along with cores from other pavement built since 1942. Stainless steel plugs were laid in the pavement to permit future measurements of pavement elongation.

With this test road completed and the passage of a successful first winter of service, the State decided to award a major contract using one type of mix ingredient which showed favorable results, i.e., commercial fly ash, a pozzolanic material. Early in 1951, a 5.8-mile section of U. S. 20

*See article, "Kansas Engineers to Study Course Ground Cement and Pozzolanic Additions," by W. J. Arndt: Roads and Streets, Sept. 1949.

between Laurel and Belden, Nebraska, was awarded to Abel Construction Co., of Lincoln, Nebr. The specifications required that 85% to 90% of the pavement area be built with concrete containing 165 lb. of fly ash and 5¼ sacks of portland cement per cubic yard. The remaining 10% to 15% of the area was to be built with a mix containing 7.0 sacks of portland cement. Air-entrainment was accomplished in both mixers by the addition of an approved additive. Local sand-gravel aggregate was specified for both types of mix, the fly ash thus being the only variable.

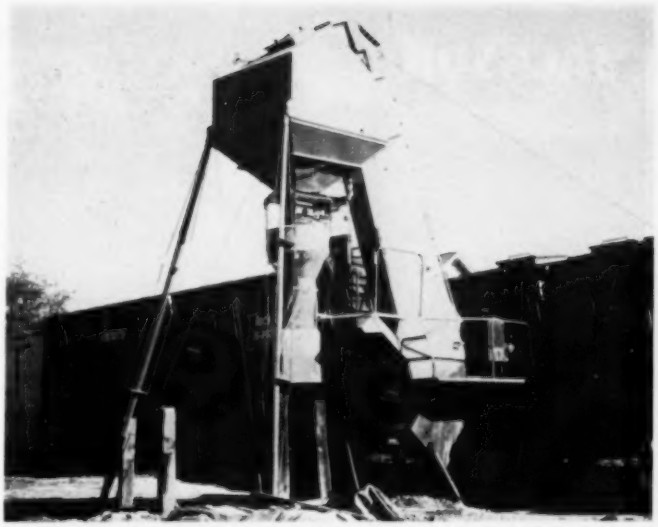
1951 Job Described

The project was designed to give the contractor a full-scale normal job operation on which to check costs for both types of mix. The fly ash was introduced on the assumption—rather clearly proven by test data—that, by acting porzolanically, this material would reduce or eliminate the harmful expansion heretofore occurring with the sand-gravel aggregates and portland cement.

The pavement is 8 in. uniform by 24 ft. wide. The only expansion joints in the entire length are four 1-in. joints occuring at 49-ft. intervals on each side of a bridge. Dummy contraction joints 3 in. deep were spaced at 16 ft. 4 in. intervals. A longitudinal deformed metal centerline joint was used, with tie bars at 2 ft. 6 in. intervals. No distributed reinforcement was used.

The portland cement was supplied by Ideal Cement Company's Superior, Nebr., plant.

The fly ash was provided by Combustion By-Products Co., of Chicago,



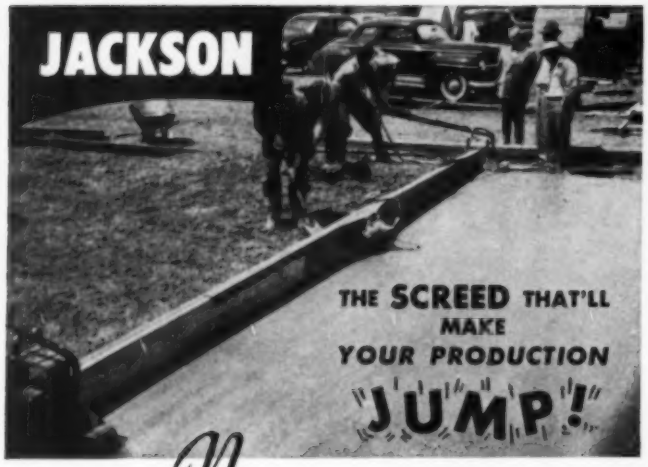
★ Abel Construction Company's elevating charger, as set for handling bulk fly ash on the 1951 Nebraska job. Bin capacity, 40 tons

and consisted of a by-product material from public utility power plant operation using pulverized coal as the fuel. Fly ash is a finely divided dry powder collected from flue gasses. The ash is comprised largely of spherical shaped, smooth, glassy particles, having a fineness about equal to or finer than portland cement.

Chicago Fly Ash, as commercially known, is pozzolanic—that is, it has the property possessed by certain siliceous materials of combining with lime freed in the hydration of portland cement, to form insoluble compounds possessing cementatious properties. The product when used in the portland cement concrete mix is said by its advocates to improve concrete placeability, reduce permeability, improve resistance to sulphate bearing soils or waters, lower the heat of hydration, and reduce expansion caused by so-called "cement-aggregate reaction." Also better resistance to frost action is claimed. Its use lowers the early strengths at all temperatures normal to concrete construction and the 28 day strengths at low temperatures. Above 60°F. the 28 day strengths are generally higher.

The contractor used standard equip-

★ Rear view of the Nebraska Department's Testing Laboratory, showing the concrete proving ground in the foreground. Since 1942 cores and sample beams from every type of concrete pavement constructed in the state have been taken for continuous tests. Between tests in the laboratory, the samples lay outside exposed to the weather.



Nothing compares with it for convenience, thoroughness and productivity on municipal concrete paving, highway widening, bridge-decks and similar jobs. It strikes off to any crown, undercuts at curb or sideform, works up to and around all obstructions. Permits pouring slabs up to 30' without center joint. Requires only two men on widest slab and is the only screed that can be rolled back for second passes on **4 rollers.** Powered by Jackson 1.25 KVA Power Plant. Get the jump on competition. For Rent or Sale at your Jackson distributor. Details on request.

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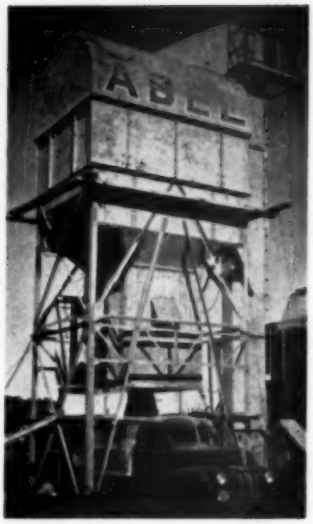

★ Except for third unit at plant for handling and batching fly ash, Abel Construction Company's outfit was "normal" for concrete paving work. Here is their 375-bbl. bulk cement dock

ment and methods throughout, with the exception that, in addition to the bulk cement dock and the aggregate stop at the plant, a C. S. Johnson elevating cement charger with undertrack crew was set up to handle fly ash from the rail car into the trucks. The only change of routine was the momentary third stop at this charger by the batch truck driven after picking up aggregates and cement.

The contractor placed as much as 1,000 ft. or more pavement in a day, paving the full 24 ft. width with a Koehring 34-E single-drum paver, a Blaw-Knox spreader, Blaw-Knox finisher, Koehring logitudinal float finisher and normal hand finishing operations. The accompanying photos indicate the characteristics of the mix. The pavement was paper cured.

H. T. Ball was project engineer for the state. Ralph Crear was superintendent. The research in connection was under G. F. Swatek, materials engineer, and R. E. Bollen, testing engineer, Nebraska state bureau of roads.

Fly Ash Specification

(As incorporated in requirements for the U. S. 20 project described in the foregoing article, awarded May 24, 1951, to Abel Construction Co.)

Description

The term "fly ash," as used in these special provisions, shall refer to a

(*Continued on page* 133)

Booklet on Weather Cycles and their Causes

By Halbert P. Gillette
(Mem. Am. Soc. C. E.)

SEVERAL years ago readers interested in weather cycles were told that a booklet on the subject would soon be printed, and that a copy would be sent on request. Type for it had been set when I decided that the essay could be considerably improved by additional research, notably as to causes of cycles, as well as to lengths and dates. It turned out that this was a much greater task than expected. Also other matters engaged more of my time than had been anticipated.

The necessary analyses of data and "field surveys" of geological evidence of climatic cycles have been completed. The original offer of a copy of the booklet to any reader is now renewed.

Those who have seen my articles on Cycles during the last 24 years will have a general idea of the forthcoming essay. But its treatment of the causation of cycles will contain much that has not been printed; for example, how ionostreams are generated in the sun, and how they are "focused" on planets by the magnetism induced in them. Explanation will be given of how the Earth reacts upon the sun by drawing many solar ionostreams toward one another, causing sunspots that generate more ionostreams. This theory leads to an understanding of how two planets in the same heliocentric longitude (in conjunction) cause an abnormal number of solar ionostreams that tend to increase rainfall by their generation of atmospheric currents.

Another reason for prolonging this research was my attempt to show that certain long climatic cycles are due to unseen planets, or if seen not recognized as planets. Uranus, whose orbital period is about 84 years, was seen 17 times (the first in 1690) before it was recognized in 1781 as a planet. Its slow motion had led short visions of it to be regarded as light from a star. William Herschel finally discovered a slowly moving object that he thought might be a comet. A few weeks observation disclosed that its orbit was nearly circular, and he announced a new planet some 19 times farther from the Sun than is the Earth.

As stated in an article in 1941 I found that several planets tended to cause either sunspots or rainfall or both when they were close to heliocentric longitude 290°, presumably when they were in a fixed stream of ions (electrified corpuscles). At first I thought this ionostream flows sunward from the region of the zodiacal constellation Sagittarius (The Archer). Later I found evidence that it issues from the sun. Among the planets that had thus caused a rainfall cycle were distant Uranus and Neptune. So it occurred to me that I might find that certain long climatic cycles were caused by unrecognized planets; and, if so, their longitudes could be determined.

As far back as 1880 a Scotch electrical engineer, Prof. George Forbes, had predicted that a planet might be found moving in a nearly circular orbit about 100 times as far from the Sun as the Earth. If so, according to Kepler's third law, its orbital period would be about 1000 years. He based this estimate on the fact that certain comets had their calculated aphelia (extreme distances from the sun) about 100 times as far from the Sun as the Earth is. He knew that each of the four giant planets has a "family of comets" whose aphelia are close to the nearly circular orbit of the planet. Therefore, since there was another "family of comets," it probably indicated a "parent planet."

In 1890, a French astronomer, N. C. Flammarion, using Forbes' theory, predicted a planet of about 320-year period. In 1928 an American astronomer, W. H. Pickering, estimated its period to be about 333 years.

I knew that the late Prof. J. A. Udden of the University of Texas had found, in a diamond drill core, evidence of a cycle of petroleum deposition of about 340 years. The drill core contained annually deposited laminae, called varves. Udden found about 340 varves between centers of black carbonaceous deposits. Since petroleum is of vegetable (planktonic) origin, that 340-year cycle to me meant a climatic cycle.

I finally got around to analyzing lake varves and tree rings in search of a cycle in their thickness that would be between 330 and 340 years. It turned out to be 336 years, apparently just four times the orbital period of Uranus. What led me to think that this planet A and Uranus are harmonic in their revolutions was that the maxima of the rainfall cycle caused by planet A occurred close to every fourth maximum of the Uranus cycle.

Using Forbes' theory, Pickering (1928) inferred a planet having a 656-year period. So I next applied my rain cycle theory to that problem; and eventually found a climatic cycle of 672 years, or double the 336-year cycle due presumably to a planet B.

A and B caused cold maxima in 1658, the year that the Baltic Sea between Sweden and Denmark froze so solid that Swedish cavalry by crossing on the ice surprised the Danes and conquered them. The only other instance of such prolonged low temperature in that region was in 1323, which is too close to the previous duedate of a wet-cold maximum of the 336-year cycle to be accidental.

Inferentially there was a heliocentric conjunction of planets A and B in 1658 when both were about longitude 290°.

Since all four of the known giant planets have nearly circular orbits close to the plane of the Earth's orbit (through the ecliptic), and since out of the ten known planets only those four giants have families of comets, I infer that A and B are giant planets, with nearly circular orbits close to the

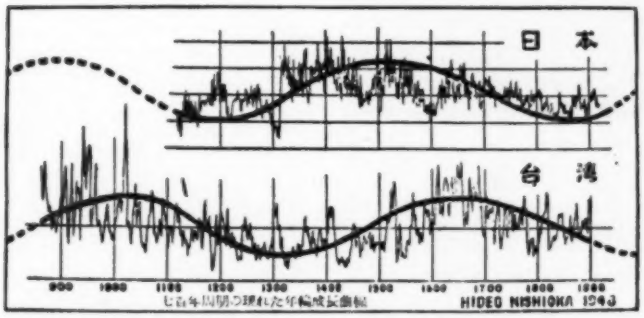

Fig. 1. The 672-Year Climatic Cycle and Subcycles in Formosa Treering Thicknesses

Reclaiming coal

Rupp Brothers, Incorporated, general contractor of Kittanning, Pennsylvania, use one of their five MICHIGAN Truck Excavators to reclaim coal for the Powell Coal Company. Coal formerly lost by diverting coal washings into rivers and streams is now pumped into settling pits and reclaimed by the mine. Rupp Brothers use this ½-yard MICHIGAN clamshell to spread the still wet coal dust over high ground for drying.

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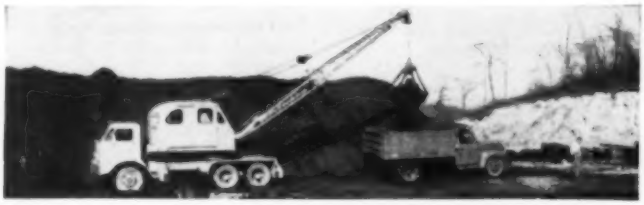

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ecliptic plane. If so A and B should be easy to find telescopically. Because of the much greater amplitude of the cycle that it causes, I would search first for B. It should now be near heliocentric longitude 87°.

The November 1951 issue of Cycles (published at 9 East 77th Street, New York City 21) carried the accompanying graph, Fig. 1, of a cycle in Formosa treering thicknesses that shows the 672-year cycle in a striking manner. The author of that article is Prof. Hideo Nishioka of Keio University in Tokyo. He calls the cycle's length 700 years, but the measured rings covered only 1040 years from about A.D. 860 to 1900. The black median curve indicates rainfall peaks about A.D. 1000 and 1650 and a valley about 1320. Data covering only 1.5 lengths of a cycle can not give either the peak or valley dates with accuracy.

The California sequoia ("big tree") rings that I analyzed go back to about 1300 B.C.; but, due to frequent inversions of phases of rainfall cycles in in that region, this cycle is not as outstandingly shown in them at any time as it is in the Formosa rings.

The most striking evidence of this cycle that I had published is in paired beds of white calcareous mudstone and black shale. Fig. 2, which was printed in WATER AND SEWAGE WORKS, March 1950. A similar cut appeared in ROADS AND STREETS a year earlier. There are 32 pairs of these rock strata in this locality near Los Angeles, and they average 4.5 feet thick per pair. The annual varves measured at that time averaged 11 to the inch, indicating that the cycle was about 600 years long, but a recent measurement of many more varves gave an average of about 12.5 to the inch, indicating a climatic cycle of about 675 years. In the articles above mentioned, it was explained that white calcium carbonate is precipitated from sea water during the warm phase of a cycle; and that an annual marine varve often has a white lamina at its center, recording the summer season.

Incidentally my "field surveys" of stratified varved rocks now have covered about half our states and much of Mexico, disclosing remarkably uniform averages of varve thickness in widely different geological horizons. Prof. Udden's 6400 varves in Texas Permian rock, above mentioned, averaged 185 to the foot. Prof. L. D. Stamp in 1925 measured many varves in Burma Eocene that averaged 174 to the foot. Archibald Geike's "seams or ribs" in English Ordovician "highly fissle shale" averaged 20 or 30 to the inch.

Such varves are the Rosetta Stones by which geological history becomes

deciphrable as to cyclic epochs. Because such cycles have repeated themselves as to lengths, though not as to amplitudes, in different geological horizons, we may be sure that they still exist. Since the last wet peak of the 672 year cycle was in A.D. 1658, its next dry valley will occur 336 years later, in A.D. 1994. For nearly a century this eventual climax of drought has clearly "cast its shadow before" in many regions. For example Nisqually Glacier, near Puget Sound, has been retreating at least since 1857, with accelerated velocity except about 1882 when a cycle of ½ of 672 or 224 years had a wet-cold peak. That 224-year cycle has a subcycle of ⅓ of its length, which in turn has one of ½ its length, and so on. Hence it is evident that not all weather cycles are caused by planets. What does cause them? An attempt to answer this highly important question will be made in the forthcoming booklet.

Fig. 2, The 672-Year Climatic Cycle and Subcycles in Varved Rock Strata

In 1919 George E. Hale discovered that sunspots usually occur in pairs rotating oppositely and of opposite magnetic polarity. I infer that they exemplify Faraday's principle of magnetic rotation of electric currents, and that the streams of ions emitted from the sun also rotate in accordance with that principle. If so, each ionostream has a core of heavy positive ions surrounded by a large shell of the lightest negative ions, namely electrons, rotating in a direction opposite to that of the core. This gives to both core and shell the same magnetic polarity, and therefore they are attracted by the opposite magnetic pole of the Earth. Hence ionostreams issuing from the sun's southern hemisphere are attracted by our north magnetic pole and other north magnetic foci, while those issuing from the sun's northern hemisphere are attracted by our south magnetic pole. Many hitherto puzzling phenomena are thus made clear.

Since similarly charged ions moving in the same directions attract one another magnetically, it follows that a solar ionostream is a strongly cohering rod. Part of the coherence is due to magnetic, part to electric forces. The sun's radiant waves propel the constantly generated ionostreams radially away from the sun, but their elasticity permits deflection toward any permanent or any induced magnetic focus. Since all radiant waves have the velocity of light, I infer that they accelerate the ions of an ionosphere until they attain either that velocity or a close approximation to it.

There is evidence that both the Earth and Sun are magnetic cores surrounded by a large number of relatively thin concentric ionospheres. I infer that these shells rotate in the same direction that the Sun and Earth rotate, in accordance with the Faraday principle above mentioned. Every comet, I believe, exemplifies the ionospheric theory, and perhaps the same is true of every star. The small bright nucleus of a comet probably is an ionosphere, and its huge head is another. At times, as in Donati's comet of 1857, a comet has two concentric heads, the outer twice as big as the inner one.

It seems significant that in the eclipse of 1937 a photograph taken from an airplane by Maj. A. W. Stevens disclosed that the pearly corona was a perfect sphere of just twice the diameter of the sun. I infer that the incandescent photosphere and the corona are two of numberless solar ionospheric shells, all rotating axially, all fed with ions from ionostreams and in turn feeding ions back into solar ionostreams, and performing another function of supreme importance. Since an ionospheric shell must refract or bend radiant waves, each solar ionostream is propelled also by refracted waves, so that energy lost by ions penetrating an ionosphere is regained, in large measure if not entirely, in this manner.

There is another refractive effect of a great series of solar ionospheres which, upon consideration, leads to startling inferences. The distances to the nearer stars have been triangulated, using the diameter of the Earth's orbit as a base line. But since no refraction, other than that of our atmosphere, was taken into account, it follows that all estimated stellar distances must be exaggerated if there is a series of solar ionospheres exceeding in diameter that of the Earth's orbit. This thought led me to infer that the "proper motions" of at least the brightest stars might be orbital motions around the Sun. On this assumption I deduced first the orbital periods and then the distances, of the 22 brightest stars, with the expectation that these distances would differ more from the triangulated distances, the greater the distance. In general this is the case. The average exaggeration of these distances by triangulation is about 130 fold.

For stellar distances beyond the range of triangulation, which applies to the vast majority of stars, formulas involving relative brightness are invoked. But since a series of solar ionospheres would obscure stars increasingly with distance, exaggeration of their estimated distances would probably be amazing. Of course estimates of volume and mass of stars and star clusters would be even more exaggerated than those of distance.

There are numerous short cycles whose lengths or pulsation periods are measured in minutes or seconds. These may be classed as microcycles, for the terms microseisms (crustal tremors) and microbaroms (barometric pulsations) have been in use for many years. A less generally known type of microcycle is seen, at times, in regular pulsations of the delicate compass needle of a magnetograph. These might be called micromagnetics. Having observed that several microcycles have the same lengths in crustal and compass pulsations, as well as in lake and ocean

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waves called seiches, I was led to investigate microcyclic phenomena. This resulted in the recent discovery that there is a triplex law of their relationship as to lengths, like the triplex law of climatic cycle lengths which I announced in 1938; namely that cycle lengths often are terms in a geometrical progression series whose ratio is three.

Microseisms (which I believe are caused by micromagnetics) have been used effectively by Marion H. Gilmore and naval associates to discover, locate and follow typhoons and hurricanes.

Therefore not only because of their theoretical but practical importance, microcycles will be discussed in the forthcoming booklet whose title will be "This Cyclic Universe."

Bibliography on Joint and Undersealing Materials

The Highway Research Board has published as Bibliography No. 12, 1951, a summary entitled "Joint, Crack and Undersealing Materials", with annotations by C. W. Lovewell, Jr., Purdue University. The bibliography is compiled from lists submitted by A. A. Anderson, G. E. Markin and E. M. Ward. Approximately 220 references are tabulated together with brief statements of the nature of each. For copy, address the Highway Research Board, 2101 Constitution Avenue, Washington 25, D.C.

Bigger Highway Volume

(*Continued from page* 57)

Winners in the AGC accident prevention contest for the past year were announced as follows for the highway field:

For contractor firms with average exposure of over 181,000 man-hours, (1st) Adams & Tate Construction Co., Roanoke, Va.; (2nd) Burrell Construction & Supply Co., New Kensington, Pa.; (3rd) Loselle Construction Co., Wyandotte, Mich. For firms with less exposure: Harry Pickett, Allegan, Mich.; Koski Construction Co., Ashtabula, Ohio; Lewis & Frisinger Co., Ann Arbor, Mich. "No lost time" reports were made by 32 highway contractor members of AGC.

News of Manufacturers

Gar Wood Appointments. William H. McAllister, heretofore district manager in the Memphis territory, has been appointed district manager for Gar Wood Industries, Findlay Division, for the Texas, Oklahoma and New Mexico territory. Guilford E. Koehler has been appointed at Memphis for the Findlay Division.

A Veteran Reminisces on . . .

Earthmoving Machines and Methods

One of the Nation's top ranking earthmovers takes time to talk common sense about job and equipment principles

By M. C. Harrison
President, Harrison Construction Co.,
Pittsburgh, Pennsylvania

THE contractor's viewpoint is very simple. Make the equipment out of the best possible materials designed to the "nth" degree for maximum production with the least amount of maintenance, and at the cheapest possible original cost. You automotive equipment designers don't have to be worried about building your equipment too substantial and thereby putting yourselves out of business. Someone will come along with a new type of equipment. They will make even your best efforts obsolete.

* * *

Hindsight, of course, is always better than foresight, but all of us have been through enough to know that we do not have all of the answers. Just think of the changes in equipment and methods since that summer of 1925, and try to imagine the changes that are going to take place in the next 25 or 26 years. There is a world of room for improvement in the methods we use to do our work, and when we figure that we are doing well to get 85% efficiency out of certain types of equipment that we own—in other words, it is down for repairs 15% of the time—there is a world of room for improvements in the construction and design of equipment.

★ Max Harrison

* * *

I have been asked to give you an idea as to how we select machines and develop methods for use on earth moving contracts. I won't pretend that you are sanguine enough to believe that we set up the ideal technical arrangement of equipment to handle each and every job. The dollar is the moving force of our business. We own a considerable quantity of earth moving equipment. If a job comes along that suits the type of equipment we own, fine and dandy! If a job comes along and we need work, we try to make the equipment we own do the job. If all of our equipment is busy and a job comes along that we like, then we have a lot of fun setting up an ideal plant, putting a little better than normal depreciation into the cost figure to take care of the gamble that no such job will again come up in the future, and very smugly and very intelligently stick in a bid—but we never get the job. There is always some other contractor who wants the job and doesn't put in that extra depreciation because he already owns some equipment.

* * *

We buy equipment not only to suit the job that we are presently doing, but with the knowledge that that same type of equipment will work efficiently on the average run of dirt moving contracts in our territory. We have kept cost figures diligently for 20 years and have bid and built so many jobs that after a little preliminary information is given to our estimators we can tell within 5% to 10% exactly what the dirt can be moved for, *providing* the weather man is reasonable, the unions stand still, and we guessed right in the first place. This is a gambling business, and anyone who makes any exact predictions as to what he can do in the construction of anything is too young to be allowed out of doors.

I'll give you an example of how this works.

One job that we have had that most of you may know about is the Charleston, W. Va. airport, [ROADS AND STREETS, July, 1945] involving 9,300,000 cu. yd. of excavation. The location is about 2 air miles north of the center of Charleston, W. Va., along what was known as Coonskin Ridge. The deepest cut on the ridge was 130 ft. and the deepest fill from the elevation of the finished runway was 230 ft. Our engineers examined the cores provided by Kanawha County, measured every individual piece of reclaimed core and determined that there was 40% solid rock or hard shale in the job and 60% of top soil and soft shale. Since the rock strata in this territory is practically horizontal and fairly uniform, we felt that we were reasonably safe in assuming that these figures were correct, so we proceeded to set up the bid, using horizontal drills for the hard rock and shale, shovels and end dump equipment to transport it, and scrapers for the balance of the material on the job.

The engineers calculated, from a mass diagram, that the average haul was slightly over 1400 ft., and that the average grade on the haul roads would be 7%.

We were just finishing up the dirt moving for Stone & Webster at Oak Ridge, Tennessee, where we had moved about 11,000,000 cu. yd. of excavation, so we felt we had ample equipment to handle this particular job. We could use rubber tired, self-propelled scrapers for the long shale and dirt haul, small scrapers for the pioneering and very short haul, and we had about fifteen 22 to 25 yd. scrapers for the bulk of the work,

Excerpts from a talk given at the Earthmoving Industry Conference, Central Illinois Section of the Society of Automotive Engineers, Peoria, Ill., April 10, 1951. The Society's next annual conference is to be held in Peoria at the Pere Marquette Hotel, April 9 and 10, 1952.

which involved about a 1200-ft. haul one way. We had ample shovels 2¼-2½ yd. capacity, and ample end dump wagons for the shovel haul end of the job. Since an airport is the simplest type of construction work and the most efficient, generally speaking, due to the fact that the men and equipment are all within view at all times—and since after the work is once organized and equipped, it is all a matter of efficiency of equipmenment and personnel—we were very happy to put in what we call a fair price, and were low bidders.

As it turned out, our calculations were correct in every respect with regard to the type of material and our production figures. We actually moved 58% of all material with scrapers and 42% with shovels.

But we made a mistake. We had been reading the papers about how there was going to be a shortage of work and an excess of labor when the war was finished, and since the time we bid this job the end of the war was in sight, we were very happy to have this volume of business on our books to carry us over the lean period that was predicted. You all know what happened at the end of the war.

There was the greatest blast of construction that we have had in our time. Labor went wild because there was a shortage of skilled men and they could demand and got more money. Our labor cost increased 40% in the life of this particular contract and the efficiency of the operators dropped with each increase in wages. Fortunately for us, the weather man was kind to us and we were able to offset our loss on labor by our gain in productive hours per day. The greatest gamble in the construction business—the weather, made that job a profitable one. Believe me, the weather has more to do with making a hero or a bum out of a contractor than any other factor in the business.

* * *

I can give you an example of another type of job where operating conditions are reversed from those used on an airport, and where equipment has to be put to many uses. Our contract with Stone & Webster at Oak Ridge covered all of the excavation in their contract, regardless of type of work, location, or type of material, all on a 57,000 acre site, and with no plans whatsoever.

We broke the contract down to about 50 items, which we felt would cover every contingency, with a price for rock or dirt for roads, railroads, plant sites, foundations, ditches, backfill, etc., without any idea as to the number of yards that would be moved under any item, nor without any idea as to the percentage of rock to dirt in the job. The dirt in the site was either a fine yellow shale or red clay. The rock was either pinnacle limestone, granite, or marble, or all at once. The contract stated that from November 2, 1942 to May 20, 1943, were were to move 2,000,000 cu. yd. —no mention of where or what. We proceeded to ship in all the equipment we could find loose, and some we couldn't spare, regardless of its size or make, knowing that sometime we would put it to work.

* * *

Right then we began to standardize on shovels that could work efficiently as either a shovel, dragline, crane or backhoe. One shovel worked all of these in one particular week. The speed of interchange was a big factor in the efficiency of the equipment.

Picture the excavation for the foundation of some of the large plant buildings. Soft shale or red clay over limestone that varied in elevation as much as 20 ft. in 5, pinnacle stone they call it in Tennessee, and rightfully so. Buildings were close and thousands of men within range, so we couldn't drill and shoot haphazardly—we had to be careful, and fast. We would use scrapers wherever

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possible to remove the overburden of dirt and shale down to the rock, then dig the material out of the pockets in the rock with a backhoe, casting up for the scrapers to pick up and haul away, then drill and shoot, and the shovels and wagons would complete the job.

You don't get scientific about that kind of work—you tell the man there is a job to do—go do it!

* * *

Big scrapers, tractor drawn, as usual moved the bulk of the excavation. On May 19, 1943, one day before the expiration of our contract, we were behind in our work, even though we had by that time moved 4,000,000 yards, twice the contract, so in order to get more big scrapers, we bought a contractor out of business because he owned six 22-yd. scrapers in good condition, and we couldn't get them any other place. Don't ask me what happened to the rest of his equipment—we more than likely put it to work as well.

We used wornout scrapers we had bought in 1935 to finegrade streets and roads, because they had flat bottoms and we didn't have enough blade machines. We still use them for that purpose—I don't think we'll ever have enough blades.

The superintendent on that job was a genius at adapting equipment and personnel to his requirements. Plans were never more than two weeks ahead of us and then only when it rained. In other words, he never knew but what two weeks hence he would be all in solid rock, or in muck.

He put in two-way radios for all his foremen and puickups, organized crews to handle everything even to portable shooting crews—all they did was load and shoot dynamite. He built homemade equipment servicing outfits that had to cover a job 24 miles long and 7 miles wide—you technicians would faint if you were to see some of them. But it all worked, and that man is now vice-president of our outfit, I am proud to say.

* * *

I apologize for using this job as an example, since it was a war-time emergency contract. But with the crisis type of governmment we have, I can't see the end of the emergencies, so our past experiences may yet be worth something. We proved on that job alone that haywire and a pair of pliers were all that you absolutely needed to make a job run. You remember what the parts situation was, and all the new equipment was going into depots for hatching surplus. It galls us all to see the same thing happening again, and as a contractor we look to the manufacturers of equipment to use every effort to discourage useless and indiscriminate purchase by the government.

* * *

Each of us in the construction business tries to surround himself with competent assistants—eager to work. We each try to set up our equipment so that it will take care of the average of the jobs in our particular territory, so that our variables or inconstants are the weather and the productivity of the operators and laborers. If we are going to succeed in the business we have to produce as much per dollar of payroll as our best competition.

In the construction of your equipment you should always stress design that will minimize the loss of operating time caused by inclement weather and design to get the maximum amount of production with minimum of payroll.

* * *

Some attempt has been made to construct equipment to satisfy sectional requirements, but it hasn't gone far enough. We had a trend at the start of the last war to build equipment that would offset the increase in hourly wages—the government stopped it with an order that stated that no scraper could be built over 12-yd. capacity struck level—so as to conserve steel. I am surprised that no concerted howl went up, because we can prove that a scraper twice the size will move half again as much dirt with the same amount of steel and the same amount of payroll, thereby saving steel.

The success of our industry and yours has been achieved by being able to produce more at a cheaper unit cost—not in trying to sell at the highest possible price, regardless of quality. If we lose sight of that fact our days in business are numbered. A lot of us are lulled to sleep by politicians' talk about security—the Hawaiians have a word that describes this exactly—it is pu pui—meaning crazy.

★ E. J. Harrison, Chairman of the Board, Max C. Harrison, President Harrison Construction Company. Thurman C. Tejan, Executive Secretary, Constructors Association of Western Pennsylvania.

Harrison Construction Co. Wins Safety Plaques

The Harrison Construction Company of Pittsburgh, Pa., was the recipient recently of a plaque commemorating the winning of the coveted Zachry Trophy awarded each year by the Associated General Contractors of America, Inc., to a contractor in the United States for the outstanding record in Accident Prevention. This plaque is a permanent symbol retained by the winner of the Trophy which passes yearly to each successful contestant.

Thurman C. Tejan, Executive Secretary of the Constructors Association of Western Pennsylvania, presented the plaque to E. J. Harrison, Chairman of the Board, and Max C. Harrison, President of the Harrison Company, on behalf of the A.G.C., Inc.

News of Manufacturers

Baldwin-Lima-Hamilton Appointments. Paul R. Ehrgott has been appointed assistant to the resident vice president, Baldwin - Lima - Hamilton Corporation, Lima-Hamilton Division, Lima, O. In addition to his duties as assistant to the vice president he also will serve as sales manager in charge of all sales of shovels of 3 cu. yd. capacity and larger. J. J. "Jack" Hardesty has been appointed sales manager of small shovels and cranes.

Texas Experience with Colored Route Markers Through Cities

By Fred T. Bennett

Engineer, Traffic Service, Texas Highway Department, Austin

Colored route markers have been erected in several of the larger Texas cities on an experimental basis. In June 1945, a color scheme was devised for marking four highway routes through the City of Austin. These markers were left in place for a period of about two years, and at the end of that time, the reflective material on the signs needed replacing. We did not replace the signs with the color combinations but returned to the national standard color of a white reflectorized background with black letters and border.

The experiment conducted with the different color combinations for route markers was not large enough in scope to justify definite conclusions, but the following conclusions were indicated:

1. Colored route markers have a greater target value than the standard color combination of white and black.

2. Due to diffusion of light from the reflective material, the legibility distance of the sign message of the colored route marker showed no appreciable advantage over the standard marker.

3. Highway routes through cities are easier to follow when marked with colored route markers once the motorist establishes the color combination of the route he wishes to follow.

4. Had the experiment been carried out on a Statewide basis, we would have had quite a problem of avoiding conflicts between color combinatio s for different routes.

Inasmuch as our studies were conducted on a limited scope, we feel there is a definite need for further research before colored route markers can be considered for adoption as standards. Some points on which there is need for more information are:

1. Target value distances and legibility distances of colored route markers in comparison with the standard white and black combination having a reflectorized background.

2. Effectiveness of colored route markers in areas where there are numerous advertising signs of various colors.

3. Motorists appraisal of colored route markers.

4. Feasibility of assigning color combinations to interstate routes and a plan for controlling the assignment of the color combinations.

The scheme of different color combinations for route markers never seemed to gain much favor with the AASHO, and since we are trying to follow the Uniform Manual on Traffic Control Devices as approved by the AASHO, we are now using only the standard color combination of a white reflectorized background and black letters and borders.

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News of Manufacturers

Distributors for Denver Equipment Co. Road Machinery Supply Co., 210 East 1st St., Duluth, Minn., has been appointed exclusive distributor for Denver Equipment Co., Denver, Colo, for Northern Wisconsin and Northern Minnesota. Charter, Inc., 114 Front St., Ishpeming, Mich., has been appointed distributor for upper peninsula region of Michigan.

Blanel Elected President. J. P. Blanel has been elected president of Diamond Iron Work and Mahr Manufacturing Co. Division, Minneapolis, Minn., following the resignation of L. J. Reay. Mr. Reay will continue as a member of the board of directors.

Chicago Metal Hose Changes Name. The firm name of Chicago Metal Hose Corporation, Maywood, Ill., has been changed to Flexonics Corporation, as being more representative of the broad scope of present and future operations of the corporation.

★ Power windrow loaders were used in ditching and clean-up work by the Kentucky contractors. Front end loaders of the heavy-duty type such as shown here were used by contractors for re-ditching, helped in final dressing of the surface as well as in clean-up work

Kentucky Tries Contract Ditching

DURING 1951 over 100 miles of roadside ditches in four counties of District 4 of the Kentucky Department of Highways were cleaned and re-cross-sectioned by contractors. So successful was this experimental handling of the work that in the coming year a larger mileage of contract ditching is expected.

According to George Hailey, director of the Division of Rural Highways, the work was tried out after canvassing the various highway district engineers and finding one engineer willing to try the contract method on Kentucky's Rural Roads—those for which the state gives aid to counties while remaining county owned. Bids were taken on proposals for road-miles and also on a ditch-mile basis. The road-mile basis is considered more satisfactory.

Individual contracts usually ran in the neighborhood of $5,000 to $6,000, and the average cost of about $250 per mile proved to be below the estimates prepared by district engineers as based on previous force-account procedures. Director Hailey expresses considerable doubt that the same work could be done as cheaply by state forces, particularly when district overhead and supervision are added to the actual payroll and equipment costs.

Highway leaders in Kentucky feel also that the contract method provides a means of more positively controlling the important work of cleaning and renewing side ditches. There has been difficulty in getting the district forces

★ This contractor in handling an approximately 20-mile section of re-ditching, used a motor grader, a front end loader and necessary trucks.

★ Opening up side ditches unclogs the drainage of a road, giving it greater durability and load-carrying capacity. Here are "before" and "after" scenes showing the nature of the work performed in the experimental contracts

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to make a prompt start on such work when needed, and the drainage repair has always been subject to numerous delays when undertaken by state crews.

The re-ditching was performed under a complete set of special specifications, drawn up by the department after consultation with individual contractors and with the Kentucky Association of Highway Contractors.

Very little hauling of material was required in connection with pulling the ditches. Specifications drawn specially for this work permit, when practicable, that the material be used to bring shoulders to grade, or to widen adjacent fills. Or, if the contractor can complete arrangements with abutting property owners, the ditch material may be wasted on the farms.

In a typical operation, the traffic-bound surface is windrowed near the center of the road, the ditch is pulled and the material windrowed and then disposed of. Then the surface material is bladed back into position and the contractor moves on to the next portion of the job or to another road.

The Highway Department procedure is for the Division of Rural Highways to first make recommendations as to which roads are to be ditched and the number of miles included. Recommendations are then forwarded to the Division of Design where necessary steps are taken for receiving bids and entering into contracts. When the work is awarded, the jobs are then taken over by the Division of Construction, C. B. Owens, director, and all work is performed under this division's supervision.

This more or less experimental work in our District 4 was under supervision of district engineer R. C. Pile and assistant district engineer of construction and rural highways, respectively, L. J. Parish and H. R. Ditto.

Lime Stabilization

(*Continued from page* 69)

adaptable to city streets, parking areas and other areas where existing bases might otherwise have to be removed before placing new materials in order to maintain proper grades.

4. Lime stabilization materially increases the strength as measured by the California bearing ratio method with increases of 300 to 700 per cent being very common. Laboratory results indicate that lime-stabilized clay soils may make satisfactory bases. Field tests are planned for the near future.

5. Lime-portland cement stabilization is being used with much success. The lime lowers the plasticity index making the portland cement combine readily and efficiently with the soil particles. The ease in pulverizing, after lime is added, helps offset the extra manipulation required by using two admixtures.

Acknowledgments

In developing the program of lime stabilization in the Fourth Army Area, the cooperation and advice of personnel of the Texas Highway Department has been most helpful.

This lime and lime-cement stabilization program is under jurisdiction of Colonel R. E. Smyser, Jr., Army Engineer; Mr. Dennis Griffith, Chief, Buildings and Grounds Division; and is carried out through the Roads and Railroads Branch, Engineer Section, Headquarters Fourth Army, who perform direct technical guidance of the program. The authors, Mr. Maynard G. Fuller, Supervising Highway Engineer, is Chief of the Roads and Railroads Branch, and Mr. Gordon W. Dabney, Highway Engineer, is Assistant Branch Chief. Mr. Conrad Kelley, Chief, Headquarters Fourth Army Engineering Materials Laboratory and Mr. Curtis Brown, Assistant Chief, performed all laboratory investigational and control work.

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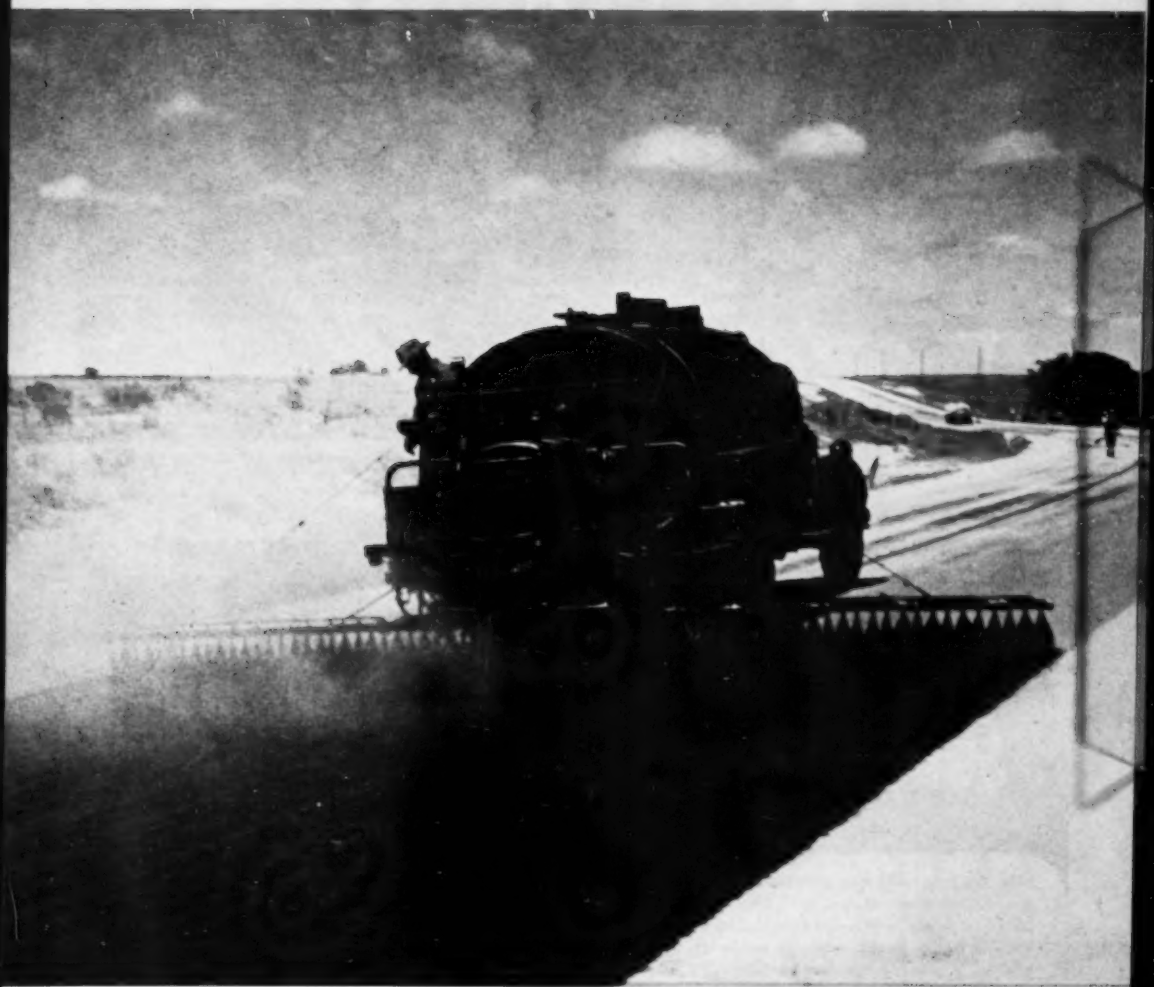

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Cover Scene

Surface treatment in progress in Abilene District, Texas Highway Department. Uniformity of control plus thorough early rolling result in "one year old" chip-free surface of remarkably good riding quality

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MARCH, 1952

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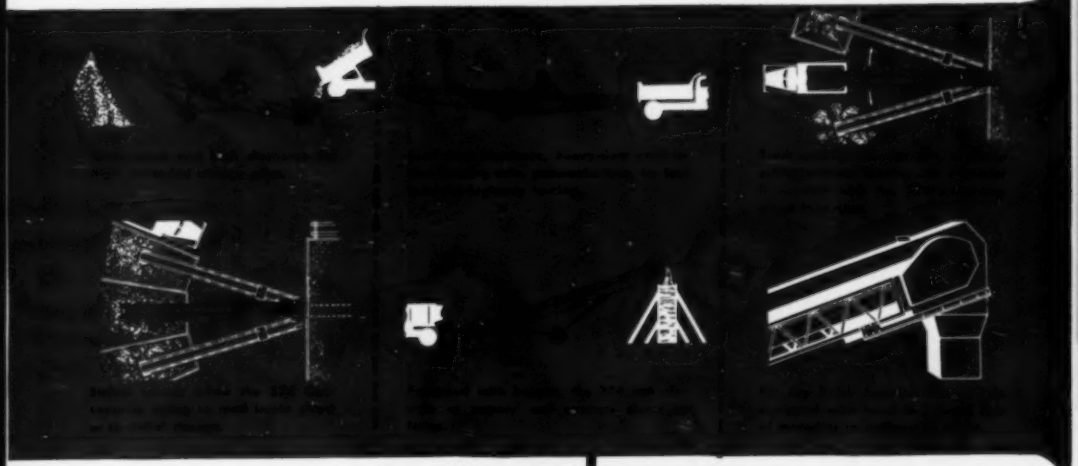

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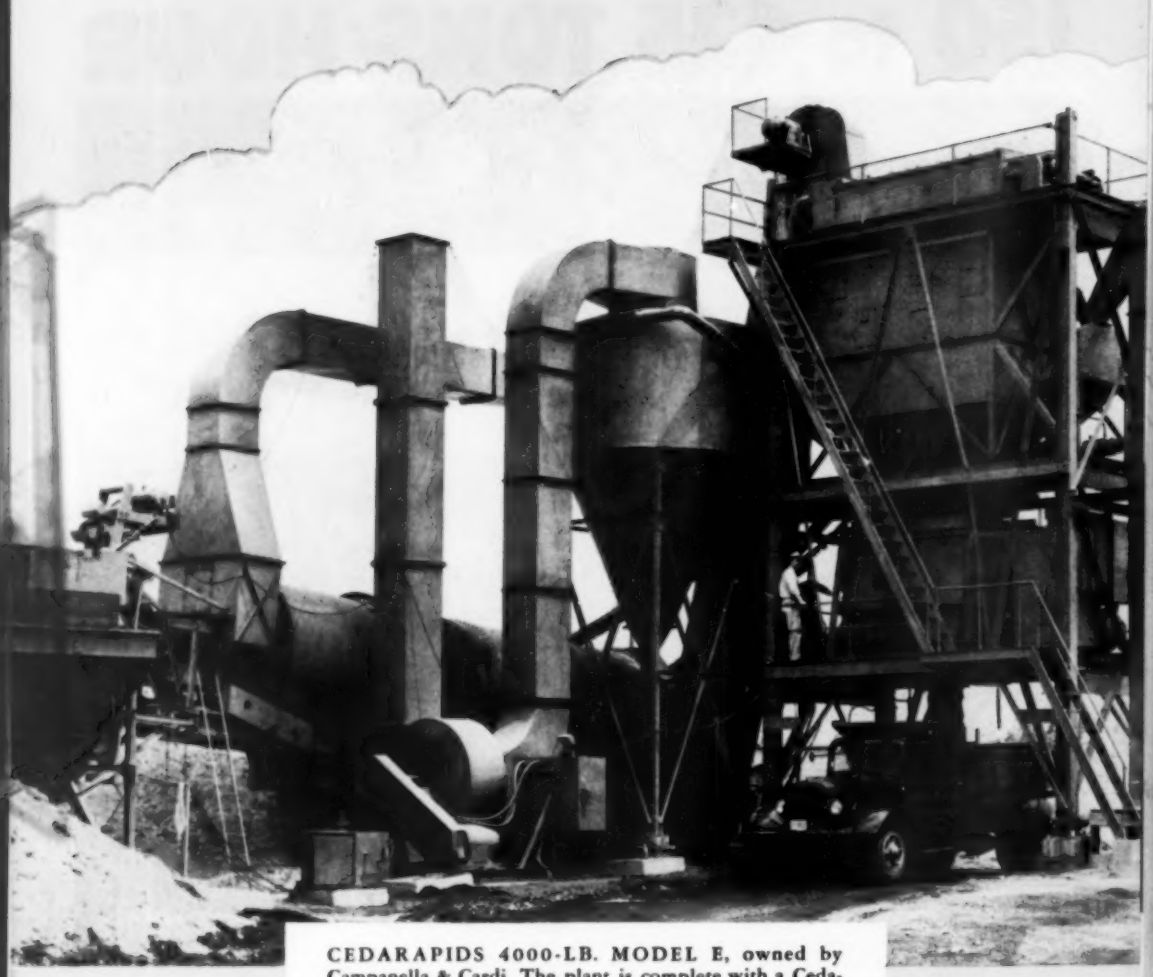


CEDARAPIDS 4000-LB. MODEL E, owned by Campanella & Cardi. The plant is complete with a Cedarapids drier, charging hopper and feeder, and a 10′ cyclone type dust collector with dust scavenger and dust elevator.

THE IOWA LINE *of Material Handling Equipment Includes:* ROCK AND GRAVEL CRUSHERS • BELT CONVEYORS • STEEL BINS • VIBRATOR AND REVOLVING SCREENS • UNITIZED ROCK AND GRAVEL PLANTS • FEEDERS • PORTABLE POWER CONVEYORS • PORTABLE AND STATIONARY STONE, GRAVEL AND SAND PLANTS • REDUCTION CRUSHERS • BATCH TYPE AND VOLUMETRIC TYPE ASPHALT PLANTS • DRIERS • DUST COLLECTORS HAMMERMILLS • WASHING PLANTS • VIBRATING SOIL COMPACTION UNITS • DOUBLE IMPELLER IMPACT BREAKERS

AIRPORT SURFACING PROJECTS... *that's why we buy* CEDARAPIDS"

says **Campanella & Cardi**
Construction Company
Hills Grove, Rhode Island

HERE'S another contractor who is 100% sold on Cedarapids equipment and the Cedarapids advantages that permit low bids on black top surfacing jobs. Campanella & Cardi are supplying bituminous concrete for the Limestone Air Force Base at Limestone, Maine, using two Cedarapids Asphalt Plants...a 4000-lb. Model E and a Model FA. Their two-year contract calls for production of 150,000 tons for the Base, and with their Model E averaging 125 tons per hour under the direction of Joe Papitto, Superintendent, *the job is now half done and ahead of schedule,* with 75,000 tons already produced!

No wonder so many low-bidding contractors buy Cedarapids!

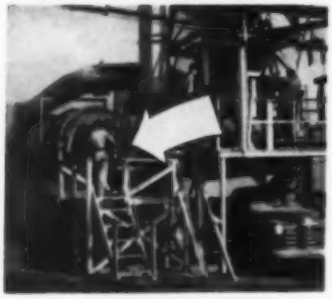
Check these
money-saving features of CEDARAPIDS Bituminous Mixing Plants

- High capacity 88" x 28' drier allows operation at full capacity regardless of whether or not aggregate contains a high percentage of moisture.
- Use of multiple burner type pressure air atomizers results in extremely low fuel oil consumption.
- Because all mixing takes place below the center line of the pugmill shafts, a completely coated mix can be obtained in 10 to 15 seconds.
- Built-in portability, rugged construction and fast operating controls result in less downtime. Combined with a faster mixing cycle, these features mean lower costs per ton.
- Central operator's panel, air controls, signal lights, interlocking time controls, complete portability, self-erecting tower and rapid set-up are a few of the Cedarapids features that insure ease of operation with absolute accuracy of mix to speed production and make possible LOW BIDS.

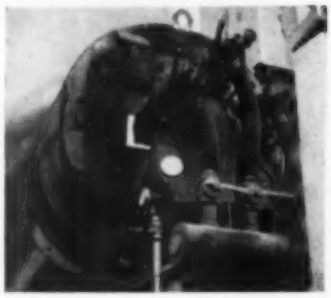
CEDARAPIDS MODEL FA, also used on the Limestone job. In addition, Campanella & Cardi have a 3000-lb. Model E Plant, purchased in 1945, which is still producing.

IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa, U.S.A.

At Sam Finley, Inc., Atlanta, Georgia



Finley Plant No. 1 has a Hopkins Combination Oil-Gas Dryer Unit



"We have 10 Plants using
HOPKINS VOLCANIC DRYER UNITS"

● Looking for a low-cost burning system for your asphalt plant? Let Sam Finley, Inc. tell you about their experience with Hopkins equipment: "We have ten plants using Hopkins equipment, and in every case, the units have proven very satisfactory to us. We find they have increased production and lowered fuel consumption. Our first Hopkins unit was installed several years ago, and we have been installing them as fast as possible since that time. All of the Hopkins Volcanic units have given us excellent service."

Why don't *you* take advantage of Hopkins' efficient operation, as has the above contractor? A letter or phone call will bring you descriptive literature, complete details, and follow-up by a Hopkins representative.

HOPKINS VOLCANIC SPECIALTIES, INC.
ALLIANCE, OHIO

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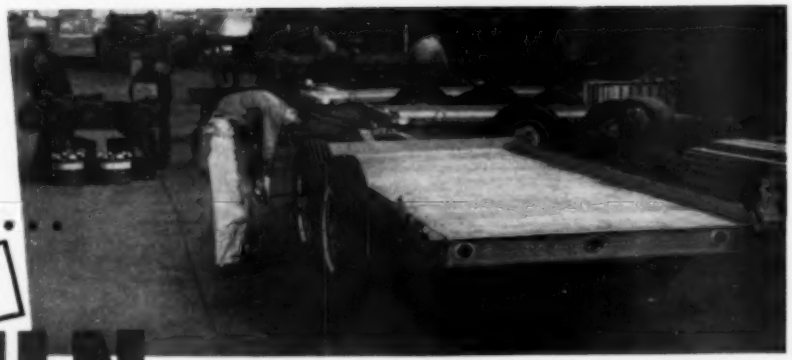
here they are . . .

NEW



JAHN TILT TRAILERS

ready for spring shipment!

To better serve our customers we have increased facilities to meet the constant demand for Jahn Trailers. Additional production equipment and the latest techniques enable us to supply the engineering and construction industry with rugged, dependable, modern trailers for delivery this Spring. Fill in the coupon for literature on the popular models now in production.

THERE'S A JAHN TRAILER FOR EVERY HAULING NEED

Tandem Axle Trailers

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Jahn Trailer Division
Pressed Steel Car Company
6 N. Michigan Ave. Chicago 2, Ill.
Dept. 605

Dear Sir:
Send me literature on Jahn Trailers of the load limit checked, with no obligation to me.

☐ 8 ton tilt ☐ 20 ton semi ☐ 25 ton semi ☐ 30 ton semi

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Address _____

City _____ State _____

Bottom-Dump Euclids have a struck measure capacity of 13 to 25 cu. yds. . . . powered by a diesel engine of 190 or 300 h.p. . . . loaded top speeds range up to 35 m.p.h.

"Eucs"

Here's a team — the Euclid Bottom-Dump and the Euclid Loader — that has set new records for low cost earth moving on a wide range of jobs . . . dams, levees, airports, highway and railroad construction, industrial plant grading and overburden removal.

Bottom-Dump Euclids combine rugged construction, large capacity and fast travel speeds for more profit per load. Designed and built for rugged off-the-highway hauling, "Eucs" provide dependable performance and low hauling cost per pay yard. Owners say: "Bottom-Dumps sure do the job, and at lower cost, too."

Built to match the speed and efficiency of other Euclid earth moving equipment, the Euclid Loader is designed for use with Bottom-Dump "Eucs" and other large capacity hauling units. It provides fast, mobile loading of practically any material, from loose sand to hard clay and shale, in a short travel distance.

The EUCLID ROAD MACHINERY Co.
Cleveland 17, Ohio

The Euclid Loader leaves a smooth, clean cut when grading uneven contours. Operator has instant control of belt movement and adjustment of the cutting blade for depth and angle of the cut.

EUCLIDS

YES! Your phone controls the valves at Ohio Oil's great, modern refineries.

HERE'S HOW:

Ohio Oil's direct, unified, one-company operation—from oil field to refinery to you— puts *you* in complete charge of delivery dates. Almost without exception, you can speed up or hold up shipments to suit your local job conditions . . . just by stretching out your hand and dialing a number!

Ohio Oil's ample storage facilities at the refinery assure *speedy filling* of your order. (Over 30 different types and grades of asphalt are kept on tap at all times!)

And Ohio Oil's adequate loading facilities and ready tank car supply gets your shipment under way *fast*. Yes, even during the "peak-season" rush, you're assured *flexible, on-time delivery* of the asphalt you order from Ohio Oil.

The OHIO OIL Company

ASPHALT DEPARTMENT

FINDLAY, OHIO • LOVELL, WYOMING • *Producers of Petroleum since 1887*

CONTACT NEAREST OFFICE FOR ALL GRADES OF LIQUID ASPHALT AND ASPHALT CEMENTS

MARATHON

Revamping a Wartime Base for Jets

Methods used in strengthening and lengthening runways, and otherwise adapting a military airfield for today's new requirements, are given in this summary published in the Navy Civil Engineer Corps Bulletin

By Lieut. (jg.) Homer W. Flippen, CEC, USN

PRESENT TRENDS in aircraft design toward heavier, more powerful planes have necessitated the expansion and improvement of many air stations of the Naval Shore Establishment. Faster craft, with their subsequent greater landing and takeoff speeds, require considerably longer runways than were previously needed. Furthermore, wheel loading has increased considerably beyond the design load factors of a few years ago.

With these considerations in mind, the first stage in the development of the Marine Corps Air Station, El Toro (Santa Ana), Calif., into a master jet field consists of lengthening and strengthening the runways. As a consequence, many other problems have been encountered, principal of which are increased lighting and drainage requirements. To accomplish these improvements, a $6,490,000 lump sum contract was awarded to Bressi and Brevanda Constructors and A. Teichert and Son, Inc. Previously, a contract had been let to Quinton Engineers, Ltd., of Los Angeles for architectural and engineering services. The contract was awarded on July 25, 1951, and Captain A. I. Flaherty, CEC, USN, was appointed officer in charge of construction. A 360 day period was allowed for completion.

Existing Runways. Design of the runways was based on a load of 20,000 lb. per wheel at 250 psi. tire pressure; plans were made and overlay quantities were computed for this factor. The maximum allowable longitudinal grade is 1% with a maximum rate of change in grade of 0.3% per 100 lineal feet. Transverse grades are held to an upper limit of 1½%.

Existing landing facilities consist of five runways lying in a figure 4 pattern with two parallel runways lying east and west and two north and south. The fifth runway lies N.E.-S.W. and intersects the ends of the other runways. Since the prevailing wind is from the west, the east-west runways are used primarily except for ground-controlled-approach landings, which are made on one of the north-south runways. One of each set of parallel runways was built with asphaltic concrete and one with portland cement concrete. The northeast-southwest runway and all taxiways were built of asphaltic concrete.

Although limited funds precluded the lengthening and strengthening of all the runways in the first stage of development, it was thought necessary to extend to 8,000 ft. the two east-west runways that lie in the direction of the prevailing wind and are used predominantly. The north-south runway, used for ground-controlled-approach landings during inclement weather, is to be extended to 8,000 ft. The other north-south runway will be extended only on one end to a total of 6,310 ft. The northeast-southwest runway will be strengthened but not extended.

Contractor Quarters. The contractor was permitted to establish an area on the station site for expeditious handling of personnel and equipment. This area is entirely enclosed with a 6-ft.-high wire-mesh fence with security established by his own guards, processed through the station Security Office. The compound includes heavy equipment, shops, p.c.c. batch plants, aggregate stockpiles, offices, and general assembly area. It is located in the least congested section of the station, which permits free coming and going to construction sites. The contractor's borrow pit for base and subbase material is located just north of the station boundaries. By installing two gates and haul roads, interference with normal station traffic has been reduced to a minimum.

Asphaltic Overlays. Strengthening of the portland cement concrete runways was designed to be accomplished

★ Spreader replaces blade in motor grader for first leveling course. Boxed in with 18-foot-long side channels, this unorthodox spreader lays 200 tons of asphaltic concrete an hour

★ Borrow pit and rock crusher just north of the station boundaries supply base and subbase materials

by an overlay of a minimum of 4 in. of asphaltic concrete, placed in two or more lifts. The method of laying the leveling lift is of interest, since an improvised spreader utilizing a motor grader is used. The blade was removed and a spreader installed in its place (see photo). Vertical control of the spreader was necessary to adjust the distance between the spreader and the existing pavement, thus controlling the amount of material being spread. The spreader itself was boxed in with 18-ft.-long channels on the sides, which further acted as levelers within their over-all length.

Not only did this machine make a satisfactory spread, but it moved with a greater spread than conventional asphalt finishers. It spread approximately 200 tons of mix per hour. Because of irregularities in the existing grades, more than 4 in. depth of overlay has been required in some places. These irregularities are removed in the first leveling lift. The final or wearing course is laid by a Barber-Greene asphalt paver.

After a small amount of asphaltic concrete had been laid on the existing portland cement concrete runways, it was noticed that a ridge had developed over all expansion joints. This is believed to have been caused by the expansion of the concrete and joint material as a result of placing the hot mix. To prevent this, the expansion joints had to be cleaned of most of the asphaltic filler before the asphaltic concrete was laid.

The existing asphaltic concrete runways and taxiways are receiving a minimum of 5 in. of graded crushed rock plus 3 in. of asphaltic concrete. A tack coat of 85-100 penetration asphalt (AP-3) was required on the original asphaltic concrete prior to placing and rolling of this crusher-run base. Because of the difference in thickness of overlay on the two types of runways, a transition course up to 8 in. in depth has been required at the intersections of the asphalt runways, taxiways, and p. c. c. runways. Considerable greater depth is required at the transition between existing and new runway extensions. Approximately 250,000 tons of asphaltic concrete is involved in the entire job.

Concrete Extensions. The runway extensions and new connecting taxiways will consist of 10 in. of reinforced concrete, laid on 10 in. of graded base material and 12 in. of native soil compacted to 95% relative compaction. The extensions and connecting taxiways of new p. c. c. will not be overlaid with asphaltic concrete, there being thus provided traffic areas not susceptible to damage from jet blast that occurs during warm up and before attaining speed in takeoffs.

Shoulders. Runway shoulders, 125 feet in width, are to be crusher-run material compacted and graded to provide adequate drainage. A penetration treatment of MC-1 asphalt applied at the rate of 0.40 gal. per sq. yd. is required on all runway shoulders for stabilization.

To overcome the problem of long material hauls, two concrete batch plants of 1500 cu. yd. per day capacity were installed on the station site. These will be adequate for both dry and wet batching for the entire concrete demand of this contract. [It is understood that one of the plants is equipped with automatic-electric push-button weigh batching controls, such as are now required on California state highway jobs and preferred by many contractors for economy and efficiency.—Editor]

Asphalt concrete plants are at approximately a 12-mile haul.

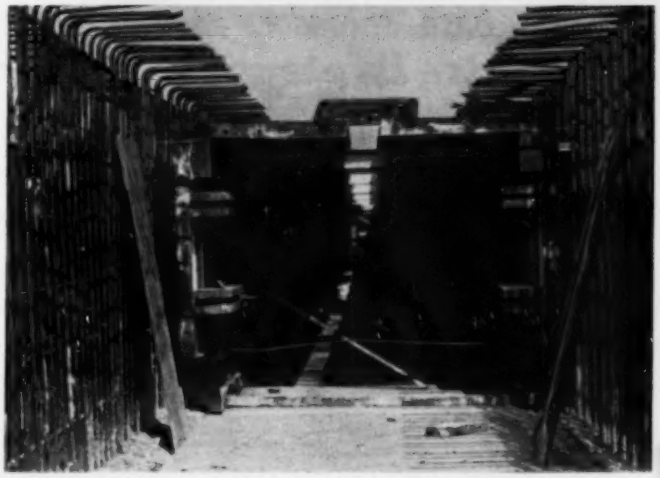
★ Aerial of El Toro air base. Very dark runways are asphaltic concrete over old portland cement concrete. Unpaved intersection are white.

Drainage. The problem of providing adequate drainage was important. The plan as developed provides for the laying of over 30,000 ft. of reinforced concrete pipe with catch basins normally spaced at 400 ft. Areas between all runways and taxiways are drained by this network.

To provide for runoff from areas outside the station that drain across the field and from a portion of the station itself, 3,500 ft. of three-cell reinforced concrete box culvert with each cell 4½' by 6' was required. The rate of pouring the large quantity of concrete required was increased by use of prefabricated steel forms. After the floor was poured and set, the steel forms for the sides and top slab was placed and poured in 75 ft. sections. For a continuous pour, the inside forms were stripped, lowered onto dollies without dismantling, and towed along the floor slab to the next section. The outside forms were removed and replaced by a crane.

Electrical Work. An important phase of the development is the installation of new and improved types of airfield lighting and the replacement of most of the existing wiring. High intensity lighting will be installed on the ground-controlled-approach runway and medium intensity lighting on all other runways except the northeast-southwest runway, which will have low intensity since it will seldom be used except as a taxiway and aircraft parking area.

Power requirements for this consist of 3-phase, 4-wire, 4,160-volt service to a vault where 6 transformers and/or regulators totalling approximately 80 kilowatts provide power to the 5 runways and taxiways. All cable for taxiway and runway lighting is carried in fibre duct and encased in 2,000 psi. concrete. Overlays on existing runways raised the runways above the adjacent lights. To bring the lighting fixtures to the new elevation, a steel collar adapter ring was designed to attach to the standard deep-base light fixtures cast in concrete in the existing runways.



★Three-cell reinforced concrete box culvert drains runoff from areas outside the station

Considerable unexpected electrical difficulties have occurred during construction. Direct-burial field-lighting cable was accidently cut by heavy equipment. During the momentary open-circuit voltage on the regulator, cables several hundred feet from the actual break have blown out for lengths as long as 10 ft., and often large porcelain blisters were formed in the surrounding sand.

Under another contract, the 12 kilovolt-ampere primary loop around the station is being placed underground. Those portions of the loop crossing runways and safety zones are being placed underground in soapstone ducts and encased in concrete under the runway contract. This was necessary so that close coordination between the runway construction and the electrical work could be maintained.

Ample power and telephone service between the ground-controlled-approach equipment site and the operations tower has also been provided.

The station was originally built for temporary use during World War II with no provisions for the presently-planned expansion. As a result, many utility lines crossing those areas on which runways and safety zones are now being built have to be lowered, and all are to be encased in concrete. In addition, the main thoroughfare, which completely encircles the field, has to be relocated to clear the four safety zones. This requires the construction of approximately 3 miles of 24 ft. asphaltic concrete road.

Acknowledgments. An A & E contract was awarded to the O. J. Porter Co. for the testing of soil and concrete paving, both asphaltic and portland cement, placed under the present runway contract. Inspection of all construction is being performed by Eleventh Naval District and Public Works Construction Inspectors under the supervision of Jack E. Davis, Construction Superintendent. Commander Thomas B. McGlashen, CEC, USN, is Resident Officer in Charge of Construction.

★ International orange and white flags warn aircraft away from sheepsfoot rollers

Highway base, secondary road or black top drives—Lay them at less cost

JAEGER Paver-Type
AGGREGATE SPREADER
costs ½ the price of bituminous pavers, accurately lays both base and surface aggregates, free-flowing hot or cold mixtures and plant-mixed stabilized soils — up to 12" thickness in widths to 11', lesser thicknesses to 12½' width.
CULTER'S
SELF SERVE
DRUGS

Designed to meet the need of both large and small contractors and highway departments, this low cost spreader lays many types of materials, in a wider range of widths and thicknesses, with the accuracy required for highway, street and airport base and both the base and top of secondary roads, parking lots and drives. Crawler or 4-wheel traction is on subgrade to avoid displacing loose material. Straight-edge runners control level of strike-off. Blends joints; can lay flush to curbs, headers. Two models, to work with all size trucks.

For details, see your Jaeger distributor or send for Catalog SPS-1.

THE JAEGER MACHINE COMPANY

223 Dublin Avenue, Columbus 16, Ohio

COMPRESSORS • PUMPS • MIXERS • HOISTS • PAVING MACHINERY

Goshorn Heads Asphalt Paving Technologists

John Goshorn, Division Engineer, Asphalt Institute, Columbus, Ohio, was elected president of the Association of Asphalt Paving Technologists for 1952. Other election results, reported from the Association's annual meeting at Cincinnati, Feb. 28-30, are as follows:

First Vice-President: Frank Olmstead, Soils Division, Physical Research Branch, U.S. Bureau of Public Roads, Washington, D.C.

Second Vice-President: Francis N. Hveem, Materials and Research Engineer, California Division of Highways, Sacramento.

Directors at large: Arnold Hoiberg, Technical Research Director, Lion Oil Company, Eldorado, Arkansas; Maury E. Macnaughton, Vice-President, Milton Hershey Company, Montreal.

Nevada Methods of Rehabilitation

By J. D. Meacham, Construction Engineer, Nevada Department of Highways, Carson City.

Nevada's rehabilitation of old pavements usually follows one of three methods, depending on conditions.

1. If the need for reconstruction is caused by a lack of good base material the old surfacing is scarified, spread over the entire width of roadway, the required additional base applied and new pavement constructed.

2. If the failure is due to rolling or rutting of the pavement itself with no evidence of a lack of base material the old material is scarified and pulverized and relaid, additional bituminous materials added if necessary.

3. Old pavements that have become dry, cracked, and ravelled but show no evidence of a lack of good base, are often repaired by covering them with 1 or 2 in. of either premixed or mixed in place of new material.

Results over a period of many years indicate that our practice of using 2 or 2½ inches of dense graded roadmix with SC-3 asphalt on secondary roads, and 2½ or 3 inches of dense graded plantmix with SC-6 asphalt on primary roads, both over varying thicknesses of good granular base depending on soil conditions, are ample for conditions in this state.

We have just completed a job using 2 inches of a very open graded mix (the so-called Virginia mix) over a badly cracked old pavement on city streets; the theory being that the open graded mix will prevent cracks in the old pavement coming through the new surface.

You can use Komac* Premix in any weather

KOMAC is still intact, while other patch mixes in foreground have been displaced and worn away. KOMAC is uniform and skid resistant, yet "tight".

*Koppers Trademark

● With this remarkable new road patching and paving premix you can repair and resurface all year round . . . rain or shine, hot or cold. Just sweep out the hole and patch with KOMAC Premix . . . compact it thoroughly, then open to traffic.

KOMAC Binders, offered exclusively by Koppers, mix easily and quickly with local aggregate. Since KOMAC Premix stays workable in the stockpile for a year or more, it is immediately available for use when you need it most. Send for free booklet. It will be helpful in setting up an all-weather repair and construction program.

KOPPERS Komac PREMIX

KOPPERS Tarmac®

For Road Building or Resurfacing

TARMAC resists the stripping action of water . . . even withstands the softening effect of gasoline and oil drippings.

You can speed up construction work with TARMAC because it penetrates quickly into roadbeds, mixes easily with local aggregates, adheres quickly and cuts through dust or moisture films to coat the aggregate.

KOPPERS COMPANY, INC., Tar Products Division, Dept. 332-T, Pittsburgh 19, Pa.

DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.

★ Careful starts and stops, careful edge control, are required on Kane County surface treatment work. Burnidge Bros. of Elgin, Illinois, contractors

Workmanship a Tradition On These Treatment Jobs

KANE COUNTY, Illinois, in the Fox River Valley west of Chicago, is noted for its excellent bituminous roads. Their durability and smooth riding quality are due in no small measure to the exacting requirements of the surface treatment contractors. Of the 960 miles of roads of all classes in this county outside of urban areas, the county maintains 252 miles. The remainder are either state-maintained or township-maintained. The 252 miles are practically all bituminous roads today. Surface treatment is the prevailing method of building up the road surface. This is usually accomplished as follows:

(1) A road is considered ready for bituminous treatment when it has been built up to a width of 22 ft. with a thickness of 8 in. minimum of compacted crushed gravel, and properly cross sectioned including road crown and side ditches. In this county it is the belief that there is no use to take over a road and try to make anything of it until you can build a good base and take care of it properly.

(2) The completed base is primed with RT-2 tar followed immediately by a light application of RT-8 tar at the rate of 0.2 gal. per sq. yd., followed by sand cover. Priming as soon as possible is considered cheaper and better than trying to maintain the traffic-bound gravel roads with the help of motor graders, on account of the tendency to wash-board. Also much of the fines in the aggregates wind up in the ditches and fields as a result of dusting.

(3) The following year the road is sealed with one application consisting of about .3 or .35 gal. of Illinois grade PA-3 paving asphalt spread at 350 to 400 degrees temperature followed by 25 to 30 lb. per sq. yd. of ⅜ in. aggregate, rolled with a flat roller. Oil and aggregates are delivered, applied, broomed and rolled by the contractor.

(4) This application is repeated again the third year.

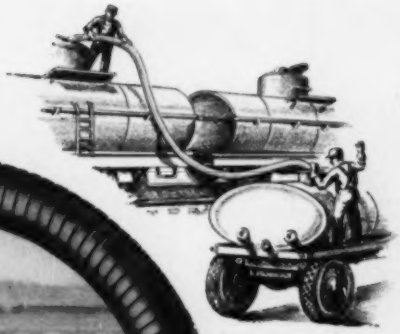
(5) Treatment is not usually found necessary thereafter oftener than every six years.

Foremen and superintendent go over the highway system every spring to determine sections where sealing is needed that year. About 40 miles of sealing or new construction is carried out annually. The 1951 program also included the grading and modernization of several miles of roadbed, performed under contract.

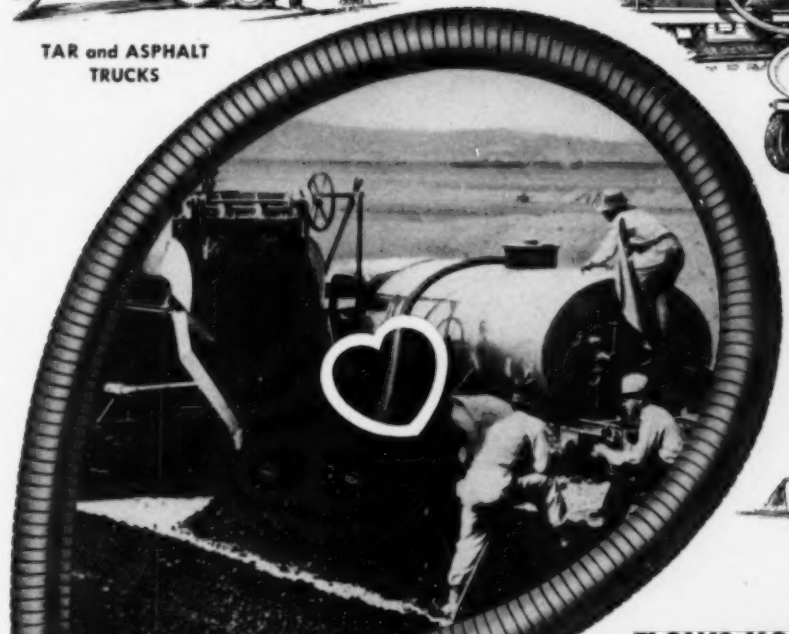
Several contractors have become familiar with the Kane County requirements and have worked informally

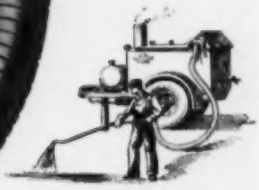
★ Slow drag, working in from the edges, is followed immediately by rolling. Contractor's experienced men know how to produce an extremely smooth riding mat

TAR and ASPHALT TRUCKS



TANK CAR UNLOADERS





TAR KETTLES

FLOWS HOT TAR FREELY ...DEFIES CONSTANT ABRASION, HEAT

LEAK-PROOF, HEAT-PROOF, WEAR-PROOF PENFLEX FLEXIBLE HOSE ASSURES SAFE TROUBLE-FREE TRANSMISSION OF HOT TAR

From coast to coast, leading manufacturers and users of road surfacing equipment rely on tough, flexible PENFLEX interlocked metal hose for safe, free-flowing, trouble-free transmission of hot tar and asphalt. Tight as pipe—but *flexible*—rugged, leak-proof PENFLEX hose defies constant flexing, crushing, kinking, abrasion and heat . . . eliminates danger of fires.

There's a tough PENFLEX hose for every type surfacing equipment. On tar mixers, tar and asphalt trucks, tar kettles, tank car unloaders—used both as flexible metal connections and as insulated hand hose for road spraying and patching units—PENFLEX assures top safety, efficiency, and dependability.

To solve your toughest tubing problems, call on PENFLEX engineering (flexineering) and the complete PENFLEX line of sturdy, hard-wearing flexible metal hose and heat-proof couplings. For full details on application of PENFLEX tubing to all types of tar and asphalt equipment, write today for Bulletin 91.

Pennsylvania Flexible Metallic Tubing Company, Inc., 7216 Powers Lane, Phila. 42, Pa.
Branch Sales Offices: **Boston • New York • Chicago • Houston • Cleveland • Los Angeles**

penflex

HEART OF INDUSTRY'S LIFE LINES

★ One of Kane County's primary roads, built up by surface treatment on a sound base. (Right): How Burnidge Bros. set up insulated trailer-mounted asphalt tank and heater at one end of a 2½-mile run, part of their 38-mile 1951 contract.

★ A county road being re-cross-sectioned by two scrapers, grader and dozer. E. W. Melahn, contractor

with county personnel to obtain outstanding results. The key-note of the thinking is careful workmanship. The distributor is thoroughly checked for mechanical conditions and accuracy. The rate of application is considered with equal care to adjust it to the needs of the particular roads. Aggregate is spread painstakingly to achieve a chalk-line edge for good appearance, and stone is usually broomed with a drag behind a tractor or truck, traveling about 4 mph. ahead of the roller.

Careful work is considered to be insurance of durability and, in addition, constitutes smart public relations since local citizens are impressed by the neatness and smooth riding quality obtained.

Claude Hansen, superintendent of highways of Kane County, has enjoyed one of the longest tenures for this post of any county in Illinois.

●

Texas led the States in 1951 in mileage of new roads built under Federal Aid during the calendar year: 1,263 miles of road, 248 bridges, 11 railway grade crossings eliminated.

Kansas Engineers Build Roughness Meter

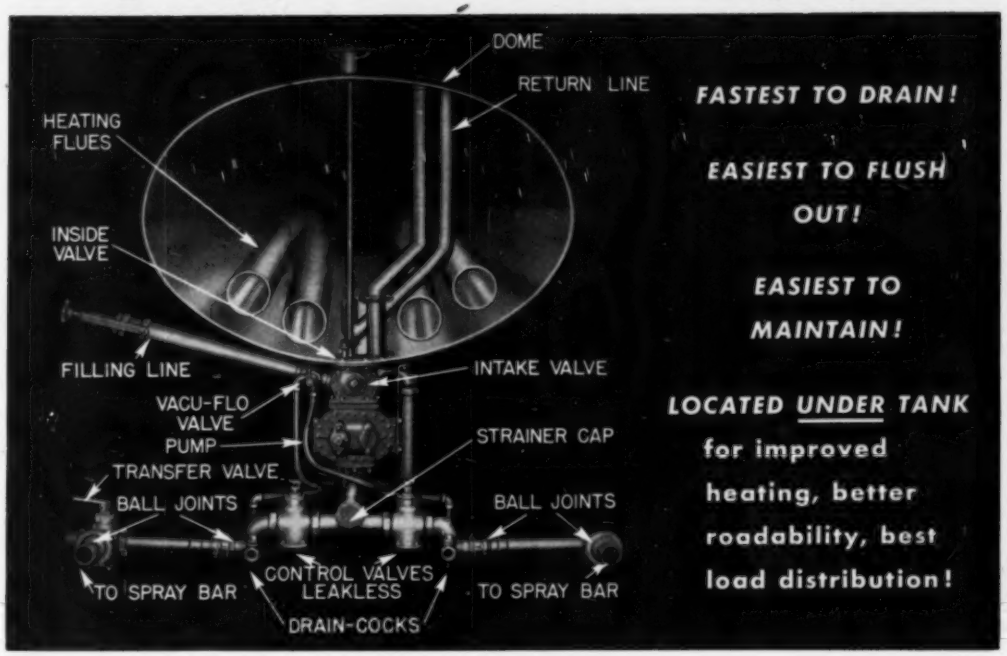
Pictured here is a machine designed to eliminate guesswork on surface condition of Kansas roads. With this machine the inches of vertical displacement of a road surface will be registered on a meter.

Built by R. T. Fry and Clarence Wagoner of the Kansas Highway Commission planning department, the roughness meter is attached to the rear of a car or truck with a meter installed in the car or truck. A tape records the rough spots in the surface and thus it can be determined the exact location and nature of these spots. The trailer weighs approximately 600 lb. and the wheel carries a 600 x 16 tire.

The machine will be used to obtain data for construction priorities and to compare the finish quality of newly constructed road surfaces. Observations over a period of time will indicate the rate of deterioration of test sections or of any part of the highway system. As an example of surface comparisons, as shown on the meter a stretch of US-75, registered 212 inches per mile displacement while another section of the same highway registered 70 inches. On hot mix surface recently placed, the meter registered 49 inches per mile.

★ Roughness meter designed by Kansas engineers

Only ETNYRE has this remarkably compact, patented Circulating System



Etnyre's circulating system, designed to take the shortest possible distance from tank to spray bar, brings you savings in weight, savings in parts, and savings in power.

Also, because the circulating system is *under* the tank, it is protected against damage from collisions or other accidents and permits a lower center of gravity for improved roadability, a better design of tank and more efficient heating.

Flanged or union connections are used throughout the system, permitting the replacement of a part without tearing down the entire system. This arrangement also permits the taking up of loose connections without strain on other members.

This unit is easier to clean and can be drained completely. Only material which adheres to walls must be washed out. Just three quarts of flushing oil are needed to wash out pump, spray bar, valves, strainers, and lines. Wall area is smaller due to compact design, thus requiring less flushing oil. In every way, during every day of operation, Etnyre users save material, time, flushing oil, dead weight!

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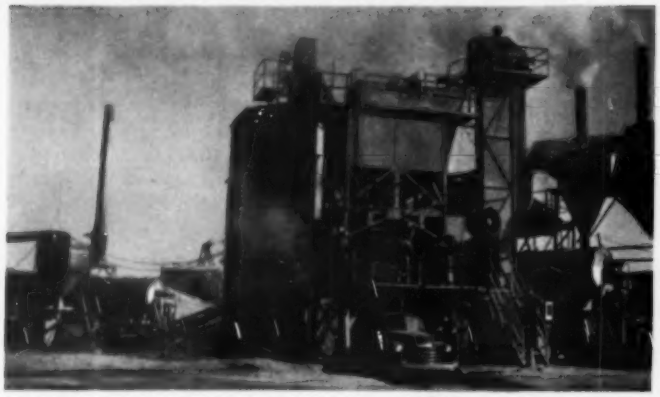
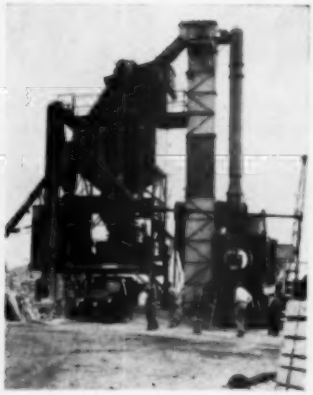




★ Hot mixed asphaltic concrete is finding increased use in Michigan. Two contractor plants pictured here

What the States Are Doing to Advance

Bituminous Methods

Continuing a series of state-by-state summaries high-lighting developments in bituminous road design, construction and maintenance

Michigan

By Charles M. Ziegler, State Highway Commissioner of Michigan, Lansing.

1. **Increased Use.** Possibly the most important development in bituminous materials in Michigan has been the great increase in their use. Bituminous work has been stepped up sharply. This increased use has come about in a large measure because we do not have sufficient funds to rebuild many of our old pavements and must extend their life by using them as bases for bituminous surfaces.

For example, during 1950 we laid 102 miles and in 1951 some 271 miles of bituminous concrete and bituminous concrete resurfacing. This growth is not confined to the Michigan state highway department; the Michigan Asphalt Paving Association reports that the cities and counties also have similar increases. The Association estimates that hot plant mixed bituminous paving materials produced during 1951 for the State Highway Department, cities and counties in the state exceeded one million tons. During the year between 20 and 25 asphalt plants produced bituminous concrete for the state. The limiting factor in production was the capacity of quarries and gravel plants to make coarse aggregate. During the 1951 season they were not able to keep up with demand.

2. **Inspector Training.** To handle the street and plant inspection for this large program it was necessary to train new men. Schools were held for construction personnel at the Laboratory during the 1950-51 winter and again this past winter. Additional laboratory technicians were also trained. It has been necessary to add a night shift in the bituminous laboratory to keep up with the required testing.

3. **Trend to Plant Mix.** Counties on the Federal Aid Secondary Program are using plant-mixed bituminous surfaces at an increasing rate, tending to eliminate road-mix construction which can be difficult and hazardous under our climatic conditions. Michigan counties are also recognizing the necessity of providing subbases over unstable soils to avoid failures in flexible surface construction.

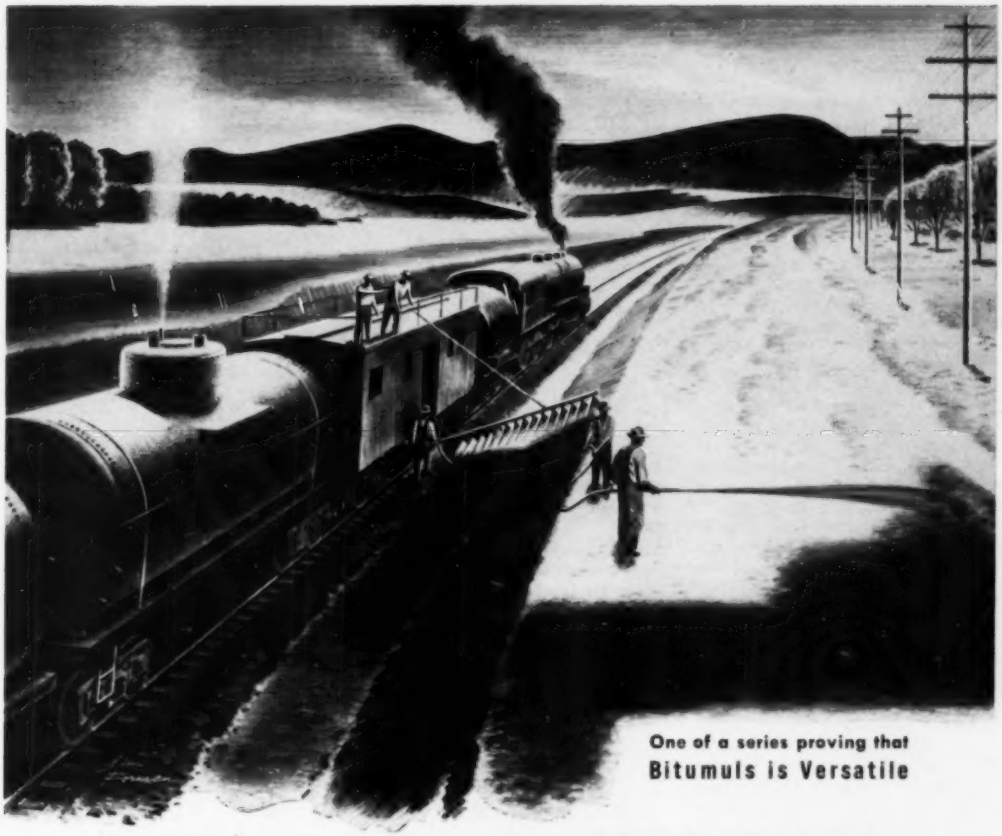
4. **Mix Design.** With regard to research that has affected our specifications, the most important was our study of means to prevent shoving on those routes where there has been a large increase in heavy truck traffic. This problem is one that is nationwide. Our studies led to the following changes in the thickness and design of the bituminous concrete mixtures for resurfacing such routes:

170 lb. per sq. yd. binder course with 130 lb. per sq. yd. of bituminous concrete surfacing, used instead of 220 lb. per sq. yd. of bituminous concrete placed in two layers.

Penetration of asphalt cement lowered from 85-100 range to 60-70 range.

Percentage of crushed particles in the binder course increased from 50 per cent to 100 per cent.

5. **Heat Stability Test.** Another investigation that may be of general interest is the study we are making to develop a satisfactory heat stability test. We found that certain asphalt cements, even though they comply with our recovery specifications, became thin and less sticky at elevated temperatures. These asphalt cements increase in penetration and decrease in viscosity when heated to mix temperatures; because of this low viscosity only a thin coating is retained on the coarse aggregate, which we feel will affect the serviceable life of such mixtures.



One of a series proving that
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How Bitumuls Controls Sand-drift for Railroads

You're running a railroad through Eastern Oregon. Sand keeps drifting onto your tracks, shifting down embankments and cut sections. Fuel oil, tank cleaning residue, and other cheap residuums fail to hold the sand for long. Maintenance costs for sand control are prohibitive.

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Diluted BITUMULS® HRM does the job thoroughly, quickly and easily. The material is routed direct to the job area in tank cars—piped to a connecting box car carrying a pump that feeds the Bitumuls direct to the spray equipment—a short spray-bar for shooting the close embankments and a long hose and slotted spray nozzle for areas out to 40 feet or more. The entire unit moves along the track as the job progresses.

Rate of application varies from an economical .3 to .6 gallons per square yard of the 1:1 dilution. Penetration into the dry loose sand is from ½ inch to ¾ inch.

Wheat grass is sown on some areas before the Bitumuls is applied. Grass shoots are held in place, giving double protection to the railroad right-of-way.

Bitumuls, versatile enough to hold shifting sands or to bind pavements to withstand the pounding of heaviest highway carriers, is made in many grades. Mixing Grades of Bitumuls are ideal for treating virtually all available aggregates. Quick-Setting Grades of Bitumuls are favored the world over for armorcoat and macadam work. High Viscosity Bitumuls is standard for surface-treating.

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Oakland 1, Calif. Portland 7, Ore. Seattle, Wash. Washington 6, D. C. San Juan 23, P. R.

Manufacturers of Asphalt and Asphaltic Products

South Dakota

By W. N. Lovejoy, Bituminous Engineer, South Dakota, State Highway Department, Pierre.

Hot mix bituminous concrete is being placed on numerous projects on South Dakota main highways. In most cases the so-called "one-aggregate" mix is specified, since our gravel pits have suitable gradations for this type of work.

Aggregate specifications for the "one aggregate" jobs usually require the addition of a silt type of filler, in order to bring the minus 200 mesh fraction up to approximately 10%. The Marshall Method is used for designing mixes. A portable laboratory is kept in the field at all times during the working season for testing stability, density and flow.

Two-bin separation of mineral aggregate is waived for single-aggregate jobs, providing the contractor meet certain requirements. One is that a stockpile of at least 1500 tons of mineral aggregate gravel must be provided in advance of starting any hot plant operation, so that gravel is not fed directly from crusher to dryer. Also a satisfactory feed mechanism must be provided to measure gravel from stockpile to conveyor into the dryer at the required uniform rate per minute. The filler must also be measured into the conveyor to the dryer from a separate pile, by means which will assure uniform delivery.

Gradation tolerances permit variations from average grading not to exceed 3% for minus ¼-in. material, and 2% for minus 200 mesh material. Inspectors are required to make hourly tests on material retained on a ¼-in. sieve, which is normally set at 33% by weight of undried material. This requirement is very important in obtaining mix uniformity, and as a means of checking uniformity in the stockpile.

A good many single-aggregate jobs are on interim projects and are laid in two lifts. The first or leveling course lift is placed with motor graders instead of pavers. Spreading is accomplished by two graders facing each other. One spreads while the other backs up; in this way about 1,000 ft. of roadway is handled at a time, while the mix is still hot. The second or wearing course is placed with mechanical pavers. For both courses, 120-150 penetration asphalt cement is usually specified, with a mix temperature at or near 300 deg. F.

The 1,000 ft. work section for spreading leveling course mix is varied in accordance with air temperature and the ability of the available equipment to handle the work. Preliminary full-width rolling of this course is required to be done promptly, by means of pneumatic tired multiple wheel rollers as soon as the mix is properly spread. Full width finish rolling is done with steel wheel rollers. No limit is placed on the length of leveling course that the contractor may place prior to placing the finish course, which is usually only ½ in. compacted thickness.

In the maintenance field we have a program of resealing, retreading and major repairs planned a year ahead, in addition to routine maintenance. The department has six small hot mix plants and is well equipped to take care of the 3300 miles of bituminous surfacing on the state highway system. We contract about 60% of our resealing work and in the future will probably contract more of it. Nearly all of our retread work is done by contract. Inasmuch as we charge out all of our maintenance costs inclusive of resealing, retreading, etc., per mile per year costs are relatively high, running well above $900.

The status of 1951 contracted bituminous surfacing work (inclusive of carryover) as of July 1 was as tabulated.

Another table shows use of bituminous materials for the calendar year of 1950.

Summary of S. Dakota State Bituminous Program

Type of Work	Miles	Average Cost Per Mile	Money
Bit. Surf. Class F	186.289	$15,570.43	$2,900,599.72
Bit. Surf. Class C-1	14.916	5,715.44	85,251.55
Bit. Surf. Class B-1	55.550	9,838.85	546,537.10
Bit. Surf. Class B-2	45.718	10,998.94	502,849.60
Base Course with Seal	82.617	11,635.25	961,263.64
Base Course with Prime	129.301	8,930.49	1,154,720.74
Blotter Treatment	42.479	3,967.67	168,542.78
Retread (Maint.)	55.043	7,615.25	419,166.15
Reseal (Maint.)	165.808	1,391.15	229,651.09
TOTALS	777.721		$6,968,588.37
Amount done in 1950 on projects carried over			1,697,585.00
Total carried ahead on 1-1-51			$5,271,003.37
Work done on these projects in 1951 to 7-1			1,157,690.39
Difference—Incomplete—7-1-51			$4,113,312.98

Carloads of Bituminous Materials Used in 1950 in S. Dakota

	Cutback Asphalts	Road Oils	Paving Asphalt	Total	% of Total
Maintenance	272 cars	165 cars	8 cars	445 cars	37.4
Construction	303 cars	211 cars	257 cars	771 cars	62.6
Summation	575 cars	376 cars	265 cars	1,216 cars	100.0

South Carolina

By S. N. Pearman, State Highway Engineer of South Carolina, Columbia.

One of the most important phases of maintenance work in the State of South Carolina is that of re-treating

★ Resurfacing of U. S. 521 South Carolina was done with least disturbance to traffic

★ Asphalt plant set up for contract resurfacing of South Carolina route 34 and U. S. 521. Sand for mix obtained immediately adjacent

old paved surfaces. Three methods are employed for this work.

The surface which has become so worn and rough that it constantly subjects motorists to accident dangers and does irreparable damage to the tires and bodies of automobiles and trucks, can be and is being made like new by resurfacing. The highway department does some of this work with its own forces, but during the last few years has let the larger projects to contract, enabling its maintenance forces to devote the necessary time to the all-important function of properly preparing the old surfacing for retreatment; and, further, enabling them to perform the many normal routine maintenance functions, such as pavement patching, improving drainage, repairing bridges, and moving shoulders.

The extensive retreatment program has been conducted without fanfare and with a minimum of interference with the normal flow of traffic. In contrast with methods employed two or three decades ago, today a road is never closed while it is being resurfaced. By means of single-lane operations, traffic is always allowed to proceed in at least one direction at a time.

Although the South Carolina department has been doing re-treatment work for years, this activity has become more extensive as traffic has grown heavier and the older surfaces have become more and more in need of repair. In each of the two past fiscal years, for example, approximately $2,000,000 has been expended on this highly important work of extending the life and practical usefulness of our main highways.

Resurfacing Types

In the 1950 and 1951 programs the resurfacing consisted of three types which, together with the mileage of each, were as follows:

	1950	1951
Class "A" single inverted penetration treatment	655	600 mi.
Hot-mix asphaltic concrete	240	280 mi.
Pre-mix cold asphaltic concrete	50	40 mi.
TOTAL	945	920 mi.

Class "A" surfacing is generally used where the type and quantity of traffic is light, and for sealing old pavements preparatory to resurfacing with one of the asphaltic mixtures. On some highways, where the pavement has been materially damaged by heavy traffic, it is necessary to build a base to support the surfacing. This was true of several sections of U.S. 17 between Yemassee and Coosawatchie River, which were resurfaced recently. The sections of pavement most damaged were covered with about 4 in. of compacted sand asphalt before being surfaced with 1 in. of asphaltic concrete. This same method was employed also on badly damaged sections of U.S. 178 between Four Hole Swamp and Summerville, as another example.

Durability Question

The question is frequently asked "How long will resurfacing last?" The answer depends on several factors, including the type of subgrade, the base, and the type and volume of traffic using the road. Many of our old roads, built for the comparatively light traffic and light trucks of 20 or 30 years ago, have failed under the concentrated traffic and comparatively heavier truck loads of today, requiring extensive repairs.

Occasionally one may observe that the pavement on one side of a highway is more badly damaged than on the other side. This is because the damaged side is carrying the heaviest loads, and is a further indication that the older roads were not built to meet today's needs, nor are they up to present day road building standards.

Oklahoma

By G. H. Bittle, Chief Engineer, Oklahoma State Department of Highways, Oklahoma City.

The Oklahoma state highway department has done considerable reprocessing of old asphaltic mixtures. However, no appreciable amount of such work has ben done by contract and the state has no standard procedure. Maintenance field forces have tried various methods of re-working brittle treated gravel surface courses.

A method that has some promise of success has been evolved from individual contributions to the various procedures required in such work. Maintenance sections were selected where additional base thickness was needed and where it would be beneficial as a leveling and re-shaping course. The surface course was removed and pulverized with a traveling loader-hammermill assembly. This windrow was metered to uniformity. Samples were obtained from the windrow for determination of the asphalt content and the ductility and penetration of the asphalt. A light cutback was added to the material and it was again windrowed on the shoulder since time is required for the cutback to disperse throughout the mass.

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As an excess of asphalt was usually found present, due to the additions of seal coats to the original mat, additional aggregate was required or exacting controls of the quantity of cutback were required so that the old asphalt was only partially cut. Partial cutting was used only where tests showed that the penetration and ductility had materially reduced during the life of the surface course. Reworking of partially cut mixtures was done only during the very hottest season and the asphalt was cut only to the extent that it could be laid during the afternoon of the day. The results are being observed to compare excessive particle coating with heavy asphalt against regular coating with lighter asphalts during exceptionally hot and cold weather.

North Carolina

From T. V. Fahnestock, Bituminous Engineer, North Carolina State Highway and Public Works Commission, Raleigh.

We have completed 82% of the goal for paving in our secondary road program, financed by a $200 million bond issue voted in 1949.* Over 4,000 miles of bituminous surfacing was completed in 1951, in addition to primary road paving and secondary road stabilization work.

Immediately on initiating this program, steps were taken to establish a division soils laboratory in eight of the ten divisions. It was realized that it would be impossible for the soils laboratory in Raleigh to handle the tremendous amount of investigation and testing of soils involved in the construction of over 12,000 miles of secondary roads as well as our usual Federal aid program.

Late in 1949 a number of men were given instructions in the fundamentals of soil testing at the Raleigh laboratory. Equipment and other facilities were provided so that the eight division laboratories were functioning by early 1950, the time the bond program really began. No division soils laboratories were deemed necessary in two of the divisions as local materials are not available in these areas of the State for the construction of soil-type base courses. The soils laboratory in Raleigh still tests the crushed aggregate and soil cement base courses used in the divisions which do not have their own soils laboratory.

A Senior Laboratory Technician with headquarters in Raleigh makes periodic visits to the division soils laboratories to supervise and check testing procedures. So far the division laboratories have tested about 80,000 samples in approximately two years and these laboratories are making it possible to maintain a close control on the quality of the subgrades and bases for bond projects.

A large amount of hot plant mix material has been used for new construction and resurfacing during the last few years. With the large number of plants operating we experienced a shortage of trained plant inspectors. A series of short courses were held in Raleigh last winter and at each one of these courses eight men were given instructions in the duties of asphalt plant inspectors. Approximately 40 men were given this training.

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*"Over 12,000 Miles Completed Under North Carolina's Bond Program by W. R. Macatee; Roads and Streets, December, 1950.

•

New Joy Distributor. Wilson Machinery and Supply Co., 139 N. Mill St., Lexington, Ky., has been appointed distributor of the construction equipment of Joy Manufacturing Co., Pittsburg, Pa., for the state of Kentucky.

Equipment and Materials for Engineers and Contractors

1
Nutlocks

Improvements in their line of locknuts has been announced by the Security Locknut Corporation. Better heat treating facilities have made possible improvements in the eliptical retainer ring which is an integral part of this nut, assuring a better lock when the nut is wrenched into position. The Security locknut is stated to make possible positive locking, exact nut adjustment, and improved speed of application. It consists of a standard steel nut and a slightly eliptical retainer ring combined in a single unit, and when applied can be used simply as a replacement for a standard non-locking type of nut. Security Locknut Corporation, North Ave. and 15th Ave., Melrose Park, Ill.

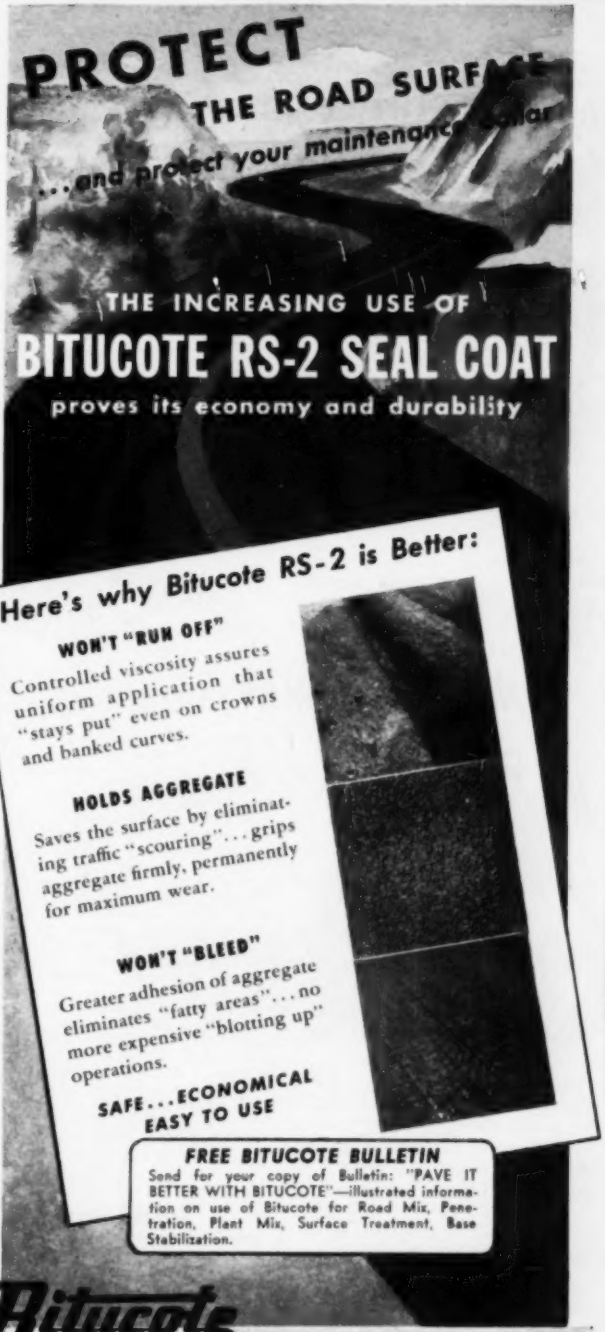
2
Hard Facing Electrodes

A new line of hard-facing electrodes and acetylene welding rods has been announced by Metal & Thermit Corporation. The new electrodes, recently added to the Murex line, include rods for extreme abrasion, medium and heavy impact, severe shock, high red hardness, and extreme heat and corrosion resistance. In addition, there is a new Murex tungsten-carbide rod claimed to provide an exceptionally slag-free deposit, allowing all residue to be readily cleaned away by wire brushing. Metal & Thermit Corporation, 100 East 42nd St., New York 17, N.Y.

3
Contractors Pumps

A completely new line of contractors pumps has been announced by Marlow Pumps. The pumps, self-priming centrifugals, have been entirely redesigned. Construction is much simpler than previous models. The pump is made up of a check valve assembly, a tank, a diffuser,

New Marlow Contractors Pump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an impeller, and a shaft seal. The check valve is conveniently mounted on the outside of the pump. It forms an accessible porthole reaching directly to the pump impeller. The tank is cast in one piece and may be removed by loosening only one circle of bolts. This exposes the working interior parts of the pump. Assembly and disassembly is exceptionally easy. Only two parts, the impeller and diffuser, can wear and reduce the efficiency of the pump. Both are easily replaced, restoring original factory efficiency. Marlow contractors pumps are available with capacities up to 240,000 gal. per hour. This includes all A.G.C. sizes plus several other sizes not rated by the Associated General Contractors. Special high pressure models for water supply and jetting are also available. Pumps can be changed from base mounted units to steel wheel or pneumatic tire mounted units without changing the base. Models equipped for burning kerosene or powered by diesel engines are available as stock items. Marlow Pumps, Box 566, Ridgewood, N. J.

4

Tractor Shovel

Another four-wheel drive "Payloader" tractor shovel has been made available by the Frank G. Hough Co., 871 Seventh St., Libertyville, Ill. It has a 1 cu. yd. bucket with 60 h.p. diesel or 54 h.p. gasoline power optional. This Model HR "Payloader" is similar to the 1½ yd. Model M. The use of large pneumatic tires, same size all around, and drive in all four wheels gives the new Payloader traction and flotation to work effectively in sand, mud and snow. Rear wheel steer

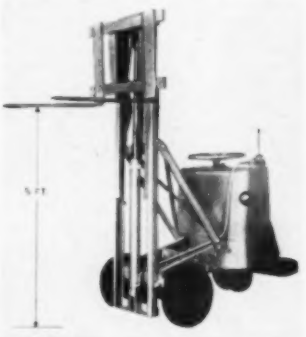
Hough Model HP "Payloader"

with power booster plus short wheel base makes it easy to operate and highly maneuverable. It has four speeds in either direction. Fingertip controlled hydraulic power raises and lowers and dumps and closes the bucket. A powerful automatic digging action independent of the forward motion of the "Payloader" is an inherent characteristic. Automatic quick tip back of the bucket is also provided. The twin hydraulic boom rams are double acting, also the ram that dumps and closes the bucket. Bulldozer blade, crane hook, fork lift and snow plow attachment are available, quickly interchangeable with the bucket.

5

Fork Lift Attachment

Development of a 5 ft. power driven fork lift attachment for the Moto-Bug has been announced by Kwik-Mix Co., a subsidiary of Koehring Co. The new materials handling device has a capacity rating of 1000-lb. at 15-in. load center. In addition, it can climb a 12-per cent grade with full load and has a 61-in. turning radius. Designed to answer special handling problems in many



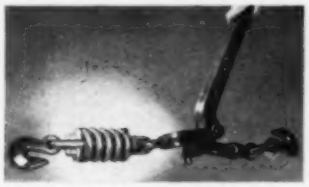
Moto-Bug with 5 ft. Fork Lift Attachment

phases of construction work in shipping centers, and industrial plants the new 5-ft. fork lift unit operates from a power driven hydraulic pump. For effortless maneuvering, operator rides on rear step, has full power forward and reverse. A large steering wheel is connected directly to the dual rear wheel through a 3.6 to 1 gear reduction. Equipped with a standard make 6 hp gasoline engine, power is transmitted by V-belt and roller chain through an automotive type differential in the front axel for reliable 2-wheel drive. Kwik-Mix Co., Port Washington, Wis.

6

Spring-Action Load Binders

New load binders featuring the compensating action of a sturdy spring,



Spring-Action Load Binder

announced by Canton Cast Products Co., were designed for military use and were accepted and specified after thorough performance and safety tests. It is stated that over all types of terrain, under all manner of conditions the spring binder maintains constant, uniform tension, eliminating breakage of chain and hooks to a marked degree. The introduction of the spring is regarded as an important advance in safer binding of loads with the "take-up" continuous action feature in the handle, an additional safety factor. Four models now in production begin at 9000 lb. capacity. Canton Cast Products Co., 2460 13th St. N.E., Canton 5, O.

7

Blueprint Cabinet

A new Draw-In-Dex cabinet that files blueprints safely and conveniently without wrinkles, creases or curled edges is available. Carefully designed and engineered to meet the problems of every organization that uses blueprints, photostats, charts and photo blow-ups, Draw-In-Dex cabinet saves valuable hours that are often spent searching for misplaced prints.

The cabinet accommodates 1,000 prints. Each print hangs smoothly. An index file locates the prints instantly. All prints are immediately accessible. Any print can be removed without disturbing the others. Suspension rods support the drawings that are very easily attached to manila hangers. Also newly developed aluminum hangers permit filing a large number of drawings together. They are designed so that when the front panel is opened, any drawing may be immediately filed or removed. Berwin Trading Co., 15 Park Row, New York 38, N. Y.

8

Safety Air Hose

A safety air hose for use on concrete busters, breakers, Jack hammers and similar pneumatic equipment, which prevents accidents caused by coming in contact with hidden power lines, has been announced by Mercer Rubber Corporation. The hose has its protection built right into it. Its specially engineered braided copper ribbon of 832 strands forms a high current-carrying medium which is securely bonded in the actual carcass of the oil-proof, abrasion- and heat-resisting hose. Mercer Rubber Corporation, 66 Reade St., New York 7, N. Y.

End Section of Hose Showing Patented Copper Wire Braid Construction for Grounding Purposes

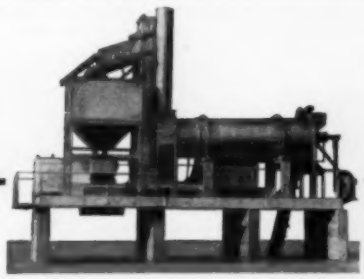
9

Propane-Butane Fueled Trucks

The motor truck division of International Harvester Co. has introduced, for the first time in motor truck history, factory-built liquefied-petroleum-gas-powered engines as Underwriters Laboratories listed equipment on trucks. International's new LP-gas (propane-butane)

International Truck Equipped with Propane-Butane Fueled Engine

engines are optional on all International truck models equipped with the company's heavy-duty Super Red Diamond engines. The new LP-gas-powered models include the LP-185, LP-195, and LP-205 Roadliners, and all other models in the L-185 through LF-210 series. Manifolding arrangement is entirely new because successful engine operation in this system depends upon a cold induction sys-



White Asphalt Plants For Moderate Paving

Complete stationary hot plants, on I steel frame, easily movable, at reasonable prices.

Excellent for medium size city paving. Successful for contractors on all street and highway maintenance; for driveways, sidewalks, industrial plants.

Supplied with oil fired rotary dryer, batch mixer, bitumen heater, vibrating screen, divided hot bin, dust collector, volumetric measure or weigh scales; air controls; engine or electric power.

Sizes: L-12, 12-15 tons per hour. Will pave 25' street, 2" thick, one 300' block per day. L-25, 25-30 tons per hour. Will cover 20' road, 1" thick, at ½-mile per day.

Also portable repair plants, 4 and 8 tons per hour.

Write for catalog and name of nearest dealer.

Elkhart White Mfg. Co. Indiana

. . . ONE USED (180 HRS.)
MADSEN ROAD PUG

Priced for quick sale ...this rugged, high production Madsen Mix-in-Travel plant is available, without power units for immediate delivery.

Capable of producing a lineal mile of 6" thick compacted material 26 ft. wide in 8 hours . . . this Madsen Road Pug gives you maximum efficiency in producing low-cost road base and surface materials for secondary roads and airport runways. Check these Madsen advantages:

COMPLETE SINGLE UNIT
EXTRA LARGE CAPACITY
NO LOADING DELAYS
SINGLE-PASS MIXING
ACCURATE CONTROL OF OIL VOLUME

MADSEN Equipment that Serves ®

Wire or write for complete details

MADSEN IRON WORKS, INC.
P. O. BOX 589 • HUNTINGTON PARK, CALIF.

ROSCO
MINNEAPOLIS
BITUMINOUS DISTRIBUTORS

5 WELL-KNOWN
ROSCO "FIRSTS"

★ Front Mounting
With application controls at the rear
★ Folding Spray Bar
Full-circulating, sump type
★ Spray Bar Safety Feature
Safety link prevents bar breakage
★ Pressure Metering
Automatic and constantly maintained application of pressure
★ Vee-Jet Nozzles
Accurate, non-clogging, no-streak application guaranteed

Rosco has developed these features, many of which are now universally used. Buy Rosco and be assured of the latest design advantages.

ROAD CONSTRUCTION AND MAINTENANCE EQUIPMENT

ROSCO MANUFACTURING CO.
3118 SNELLING AVE. • MINNEAPOLIS 6, MINN.

ROSCO MAINTENANCE UNIT

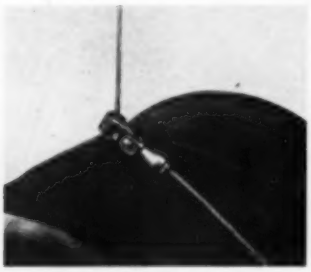
For repair and secondary construction. Both truck and trailer mounted units are available.

tem free from the hot spots necessary for gasoline engines. This was effected by completely divorcing the intake and exhaust manifolds, eliminating the connection between the manifolds as it exists in the standard engine. The standard gasoline tanks have been replaced, on the LP-gas models by heavy-steel, dual, 62-gal. liquid measure tanks and are also Underwriters listed. They are filled to approximately 90 per cent capacity, depending upon temperatures, allowing space above the liquid for expansion. These heavy, specially constructed tanks are designed to store the fuel supply under all operating conditions. The tanks are refilled at service stations by pumping the fuel in liquid form through a hose fitting which is attached to the fill valve on the pressure tank. Safety features include vertical venting pipes extending above the cab to permit discharge of relieved gas into the atmosphere; seal caps and automatic excess flow shut-off valves on fuel tanks and in the lines; electric shut-off valve; and extreme high-pressure lines and fittings. International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill.

10

Wire Rope Fitting

A choker sling fitting of new design, recently perfected by Electroline, employs two overlapping and coacting hooks which are easily applied to a wire rope to form a loop of any desired size. The rope cannot be freed from the sling until both hooks are disengaged manually thus preventing accidental release. Another outstanding feature claimed for the design is that the hooks are joined to the fitting portion



Choker Sling Fitting

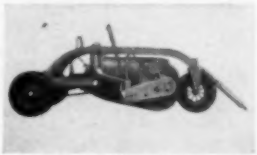
of the choker sling fitting by a pivot which allows the unit to conform automatically to the size of the load. No matter what the diameter of the load, within capacity limits, the pivoted hooks change their relative positions to that of the fitting and thereby fitting and cable maintain a straight line, when under load, eliminating flexing of the cable where it enters the fitting, thus prolonging the life of the cable. The new choker sling fitting, beside having a rope socket of the familiar Electroline type, can be furnished with a simple locking device which prevents the rope from slipping through the hooks and holds the rope firmly in loop of any desired size. Electroline Co., 4121 South LaSalle St., Chicago 9, Ill.

11

Tool Room Lathe

A new tool room lathe, announced by Logan Engineering Co., is an 11 in. swing

GRACE
Asphalt and Compaction Equipment



3 sweeper models, axle, engine or tractor powered.

Chip spreaders 8' to 12' width. Also asphaltic concrete spreaders.

Rapid Fire circulating heaters heat and unload large tanks of asphalt.

Rapidspray Maintenance Distributors. Also heaters for production melting of barreled asphalt.

Sheepsfoot Rollers 250 to 600 psi.

Pneumatic rollers 7 to 50 tons.

W. E. GRACE MFG. CO.
6007 S. Lamar Dallas, Texas

model with 1 in. collet capacity. The lathe is built throughout to tool room standards of accuracy and quality. The extra large headstock spindle is mounted in a new, heavy headstock casting. The spindle turns on a double and single row of super-precision ball bearings. A draw bar collet attachment is built in and supplied as standard equipment. A collet rack that clamps to the bed is also furnished. The carriage includes finished ground cross slide ways. Cross slide and compound rest screws include thrust bearings for smooth, accurate movement. Practically all surfaces of the carriage are machine finished. Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, Ill.

12

Trucks

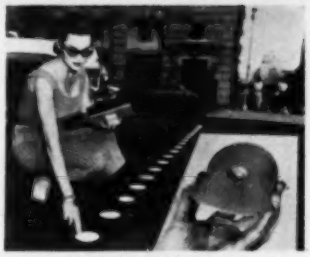
The new truck line for 1952 of the Ford Motor Co., Dearborn, Mich., offers the widest range of engines and power combinations in Ford history. The line introduces a new sedan-delivery model called the "Courier" and offers five powerful engines, including three completely new high-compression, low-friction overhead valve units. In addition to the Courier, series F-1 through F-8 Ford trucks range from light pickup units to 114-in. wheelbase and 4,700 lb. Gross Vehicle Weight up to extra heavy-duty trucks with a maximum 195-in. wheelbase and Gross Combination Weight ratings up to 41,000 lb. In addition to the three all-new engines, the horsepower and torque of the Ford 239 cu.-in. V-8 and the Ford Big Six engines have been increased to complete a five-engine power package for the eight basic truck series. The 239 V-8's horsepower was raised to 106 and its torque was increased to 194 pounds feet. The Big Six's new rating is 112 hp and torque of 217 pounds feet. All Ford engines are designed to operate on regular gasolines. The three new low-friction truck engines are the Cost Clipper Six, a 101 hp unit, and the new Cargo King 145 hp and 155 hp V-8's.

The 1952 Ford Series F-7 "Big Job" Truck

13

Traffic Lane Markers

A new flexible Dur-O-Line traffic lane marker has been announced by Traffic Safety Supply Co. The new flexible Dur-O-Line traffic lane marker can be put down on concrete, asphalt or wood surfaces just as easily as the rigid type Dur-O-Line marker that has been in use for the past five years. This type of lane marker is stated to effect substantial economies over the use of yellow paint that must be re-painted at frequent intervals. The advantages claimed for the new flexible marker are its shock resistant qualities, non-breakable characteristics, and ability to provide long wear when used in places where a large and constant flow of vehicular traffic drives over them. The cost of the new flexible type traffic lane marker is identical to the rigid type Dur-O-Line marker and no difference has been found in the cost of labor and materials to put them down. Traffic Safety Supply Co., N.E. Sandy Blvd. at 27th, Portland 18, Ore.

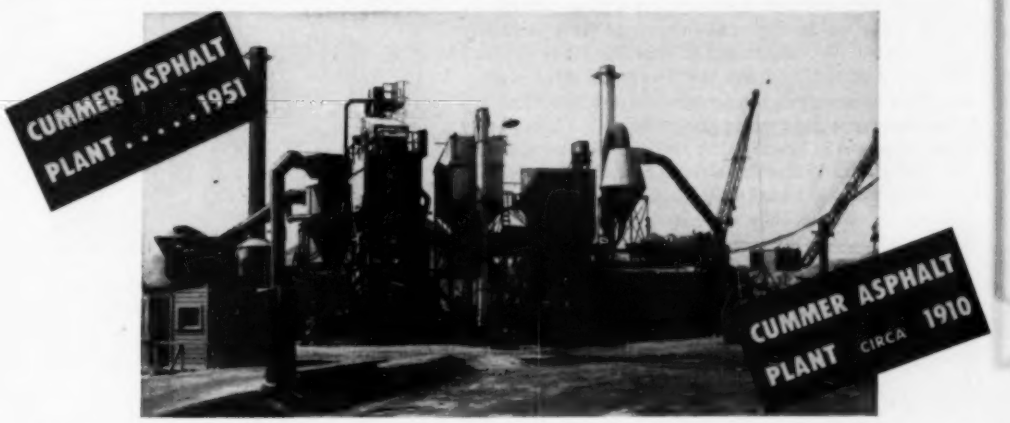


Flexible Dur-O-Line Traffic Lane Markers

14

Power Package for Motor Crane Carriers

A conversion power package for motor crane carriers, developed by The White Motor Co., is claimed to offer greater horsepower and higher operating efficiency. The engine used in the power unit is an industrial application of the White Model 280 A Mustang engine. This engine is a 6-cylinder 504 cup. in. unit with a 4¼ in. bore by 5 in. stroke rated 184 h.p. at 3000 r.p.m It has accessories to permit ready conversion. The White Motor Co., Cleveland 1, O.



"Twin plants . . . We call them Grandpa and Son . . ."

In such words does Harold Thompson of Cooke Contracting Co. describe their efficient, profit making twin plant set-up at Centerline, Michigan. Daily, these two Cummer Plants turn out peak production that more than meets the rigid state specifications. The new plant has a capacity of 1,000 tons a day. The 40 year old Cummer Plant has a 500 tons per day capacity . . . one ton mixer . . . belt and sprocket driven . . . vibrating screen has been added. Notice common dust bin. This is positive proof that Cummer Asphalt Plants give you continuous, high, efficient production. Write for catalog.

THE F. D. CUMMER & SON COMPANY • CLEVELAND 14, OHIO

BUILDERS OF FINE ASPHALT PLANTS SINCE 1893

CHEAPER STONE SPREADING!

Two of S. J. Groves Adnun Pavers spreading stone on the New Jersey Turnpike

ADNUNS are cutting the cost of stone spreading! In comparison with the tail gate and blade method, Adnuns are spreading twice as much stone in a given period of time. They are saving stone because of more accurate spreading with a minimum of spotting. They reduce the crew by half and free the grader for other work.

The Adnun gives you positive traction on all wheels whether turning or going straight ahead. There is no loss of power in handling the truck on curves as there is with clutching and declutching in steering crawlers.

Compare the Adnun with lighter, cheaper units. The Adnun is heavily built and capable of handling the heavy loads of the courser grade stone without fear of constant breakdown. The Rubber Tired Stone Spreading Attachment gives full traction and saves your rollers for black top. The Overlapping Cutter Bar carries the aggregate up to, and compacts it with the parallel course, and the Power Cut-Off permits carrying hopper loads across intersections without tag-end run outs. The Adnun has been proved on all classes of material spreading and is the only Black Top Paver unreservedly recommended for spreading both aggregates and black top. Don't buy a one-purpose or substandard machine.

The Indianapolis Speedway. Here is pavement that takes the fastest traffic known—Adnun laid 15 years ago. This is only one example of the many miles of pavement laid up to 17 years ago and still in service. Ask for the booklet, Roads That Last!

THE FOOTE COMPANY, INC.
Subsidiary of Blaw-Knox Co.
1936 State St. Nunda, New York

ADNUN
TRADE MARK REGISTERED

BLACK TOP PAVER

A BLAW-KNOX PRODUCT

15
Portable Heater

A new portable oil burning space heater announced by Chausse Mfg. Co., is especially designed to safely meet the many requirements for portable space heating on construction jobs. Advantages claimed for this Chausse Supreme unit include the following: Complete separation of the products of combustion from the air stream. Full auto-

Chausse Supreme Portable Heater

matic electric controlled unit. Deluxe heavy duty safety stack switch that will shut the burner off if ignition fails. High temperature limit switch. Fan switch that will start fan on temperature rise and also shut the fan off when the temperature drops below a predetermined setting. Heating unit can operate at any angle. Does not have to be level. Capacity of unit may be increased or decreased by changing the fuel oil nozzle. The fuel nozzle and ignition points are accessible from the rear of the burner. There is no need to dismantle the whole machine for cleaning oil orifice or inspection. Chausse Mfg. Co., Inc., 4453 14th St., Detroit 8, Mich.

16
Cummins Diesel HP Ratings Increased

Refinement in engine design of four Cummins diesels, manufactured by Cummins Engine Co., Inc., Columbus, Ind., has allowed the horsepower ratings for continuous-duty applications to be increased. Cummins engineers recently introduced a full flow lubrication system and continuous groove main bearings on engine models H-600, HR-600, HS-600, and HRS-600 allowing an increase in continuous operating speeds from 1600 to 1800 rpm. New and old continuous-duty ratings for these engines:

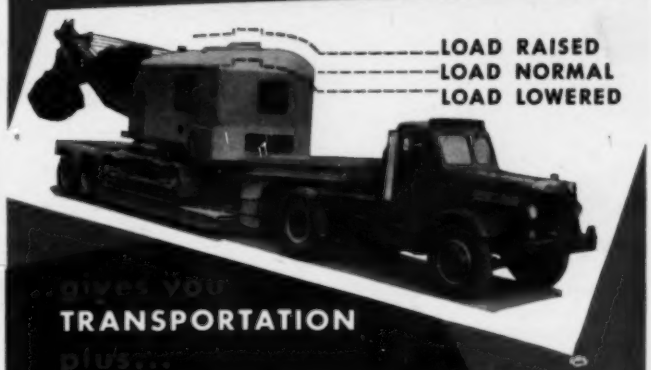
Cummins Diesel	New Rating	Old Rating
H-600	182 hp at 1800 rpm	94 hp at 1600 rpm
HR-600	115 hp at 1800 rpm	100 hp at 1600 rpm
HS-600	140 hp at 1800 rpm	132 hp at 1600 rpm
HRS-600	157 hp at 1800 rpm	142 hp at 1600 rpm

Company officials point out that this increased horsepower and rpm simplifies the application of Cummins diesels to many types of industrial equipment. The engines may now be coupled directly to centrifugal pumps that operate at a speed of 1750 rpm as well as to generators operating at synchronous speeds of 1800 rpm.

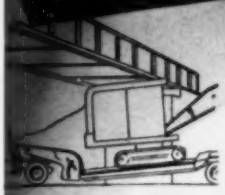
17
Impact Wrench

A new Thor portable pneumatic reversible impact wrench, announced by

Only ROGERS TYPE "TPG" Power Lift
DETACHABLE GOOSENECK



gives you
TRANSPORTATION
plus...
LOAD MANIPULATION



Snaps to clear low overhead obstructions.

Dumps its deck to clear high banked crossings.

The unique deck raising and lowering feature of this Rogers trailer makes load manipulation a distinct advantage under many hauling conditions.

Low bridge or high road bed obstacles are easily overcome. Deck is raised or lowered to alter overall height of load for overhead clearance. Raising deck clears high road beds.

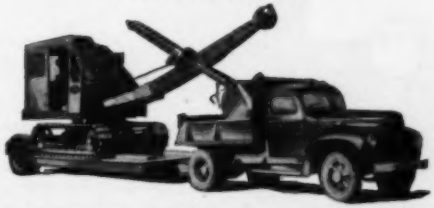
Write for literature and full particulars or call your nearest agent.

THE ROGERS Power Lift DETACHABLE GOOSENECK CAN BE OBTAINED ON ANY STANDARD ROGERS DROP DECK TRAILER

EXPERIENCE builds 'em — ROGERS — PERFORMANCE sells 'em

ROGERS BROS. CORP.
ALBION, PENNA.

110 Orchard Street



Also of timely interest is this ROGERS Tag-A-Long trailer which makes a dump truck serve as a tractor and effects sizeable savings for contractors.

For Long Life Under Any Type of Fill . . .

Manufacturers of Toncan Iron Drainage Products

BEALL PIPE & TANK CORPORATION
PORTLAND, ORE.
BOISE, IDAHO

BERGER METAL CULVERT CO., INC.
WESTMINSTER STATION, VERMONT

THE BOARDMAN COMPANY
OKLAHOMA CITY, OKLA.

BLUEGRASS PIPE & CULVERT CO.
LOUISVILLE, KY.

CENTRAL CULVERT CORPORATION
ALEXANDRIA, LA.

CHICTAW, INC.
MEMPHIS, TENN.

DIXIE METAL & CULVERT CORP.
ROANOKE, VA.

EATON METAL PRODUCTS CORP.
OMAHA, NEB.
HUTCHINSON, KAN.

EATON METAL PROD. CO. of MONTANA
BILLINGS, MONT.

EMPIRE STATE CULVERT CORP.
GROTON, N. Y.

ILLINOIS CULVERT & TANK CORP.
PEORIA, ILL.

JENSEN BRIDGE & SUPPLY COMPANY
SANDUSKY, MICH.

THE O. Y. JOHNSTON CULVERT CO.
MINNEAPOLIS, MINN.
ABERDEEN, S. DAK.

M & M HWAY MATERIALS CO.
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REPUBLIC STEEL CORPORATION
Culvert Division
CANTON, OHIO
PHILADELPHIA, PA.

THOMPSON PIPE & STEEL COMPANY
DENVER, COLO.

TRI-STATE CULVERT & MFG. CO.
TAMPA, FLA.
DECATUR, GA.

UTAH PIPE & STEEL COMPANY
OGDEN, UTAH

WISCONSIN CULVERT COMPANY
MADISON, WIS.

WYATT METAL & BOILER WORKS
DALLAS, TEX.
HOUSTON, TEX.

Specify **TONCAN IRON** ®
CORRUGATED METAL PIPE

Because corrugated metal pipe is flexible, earth loads are equalized around the pipe.

Rigid pipe cannot deflect, hence may collapse under concentrated load.

It flexes with the fill . . . stands up under heavy loads, vibration, weather changes and settling earth . . . will not crack or crumble. That's why Corrugated Metal Pipe is ideal where foundations are unstable or yielding . . . under high fill . . . or where slopes are steep.

Add to this the low-cost, trouble-free service life of a rust-resisting TONCAN IRON that contains twice the copper ordinarily used in copper-bearing steels and irons *plus* the proper amount of molybdenum to make the copper most effective. Add, also, light weight, ease of handling and installing, and you have good reason to *ALWAYS* specify Toncan Iron Corrugated Metal Pipe.

See your nearest Toncan Iron Manufacturer or write us.

REPUBLIC STEEL CORPORATION • GENERAL OFFICES: CLEVELAND 1, OHIO

Toncan Copper Molybdenum Iron Drainage Products include:
Corrugated Metal Pipe • Perforated Corrugated Metal Pipe • Sectional Plate Pipe
Sectional Plate Arches • Corrugated Metal Arch-Pipe • Sectional Plate Arch-Pipe
Corwel Subdrainage Pipe • Bituminous Coated and Paved Pipe

Independent Pneumatic Co. features the same basic impacting mechanism as the Thor "Silver Line" universal electric impact tools. Key feature of new Thor impact is an exclusive rolling ball type cam which increases efficiency and steady functioning of the impacting mechanism. The new wrench available with two types of spindles—a Size 24 with ½ in. square drive, and a Size 24S with a 7/16 in. hexagon quick change chuck integral with the spindle. Equipped with convenient side handle and trigger type throttle, the new wrench weighs only 5¾ lb. and measures 8-11/16 in. in length. A reversing valve is conveniently located at the back of the tool, and the tool can be equipped for either vertical or horizontal suspension on assembly lines, or for permanent locating of the wrench from overhead balancers. The wrench is powered by a powerful air motor which transmits power to the impact mechanism through a torque increasing planetary gear system. Independent Pneumatic Tool Co., Sales Promotion Department, 175 North State St., Aurora, Ill.

18

Truck Mixer

A new truck mixer of the revolving drum type has been announced by the Concrete Transport Mixer Co. The first unit in this type will be in the 4½ yd. mixer rating size. This mixer will be known as The Rocket, and will be made to conform to the standards of the Truck Mixer Manufacturers Bureau, whose rating plate it will carry. The Rocket will be offered with a choice of three different drives: a power take-off drive in conjunction with a hydraulic pump and motor, a straight power take-off mechanical operation; and a separate engine drive. One of the original features incorporated into this unit will be the hydraulic lift swing chute at the rear of the truck, which proved to be very popular with the truck driver and with on-the-job construction labor. Concrete Transport Mixer Co., 4985 Fyler Ave., St. Louis, Mo.

The Rocket 4½ yd. Concrete Transport Mixer

19

Long Hole Drilling Tools

For drilling long holes varying in depth from 20 to 150 ft. Rock Bit Sales & Service Co. is offering a complete set of tools for use with the standard percussion type rock drills. These tools include: Tru-Seal shank, adapters, couplings, extension rod, Rok-Bit tungsten carbide bits. They are for use in drilling grout holes, test holes, sub-level bench stopping holes or blast holes of standard diameters—1⅞ in. and 3 in. Such holes can be drilled in any type of rock or ore

Long Hole Drilling Tools

SAFE-T-CONE

Solves Traffic Problems
Quickly, Safely, Economically

- LONG-LASTING, WEATHER-RESISTANT RUBBER
- COMMANDS MOTORISTS' RESPECT
- REPLACES COSTLY, RIGID BARRIERS
- LIGHT-WEIGHT
- NESTS CONVENIENTLY FOR EASY HANDLING

In a matter of minutes you can throw up a SAFE-T-CONE barricade that leads motorists around hazards quickly, firmly, safely. Motorists are warned in advance by SAFE-T-CONE formations, preventing dangerous, abrupt stops caused by rigid barriers. Approved and accepted by hundreds of major traffic authorities.

LINE PAINTING—Rubber feet permit placing directly over line.

STREET MAINTENANCE—This safe, efficient barrier was erected in three minutes!

SAVES TIME AND MONEY ON
- Line Painting
- Street and highway Repairs
- Traffic Channeling
- Emergency Blockades
- Maintenance Work
- Excavation Work
- Utility Operations
- Asphalt Paving

. . . and dozens of other jobs.

SAFE-T-CONES STAY PUT!

SAFE-T-CONES cannot roll into traffic lanes, even when run over by careless motorists. Square base and low gravity center hold them firmly in place despite high winds and passing cars.

SAFE-T-CONES need not be placed in traffic lanes on each side of painted lines. Solid rubber feet on square base allow them to be placed directly over painted lines without "smearing."

Plan now to eliminate the expense and work of building and maintaining rigid barriers. Write us for further information and your miniature desk model of SAFE-T-CONE—the modern, preferred answer to traffic control.

SOLDER SEAL

Dept. 201
Radiator Specialty Co.
Dowd Road
Charlotte, N. C.

Please send me, without obligation, my miniature desk model SAFE-T-CONE paper weight and pen holder with SAFE-T-CONE literature.

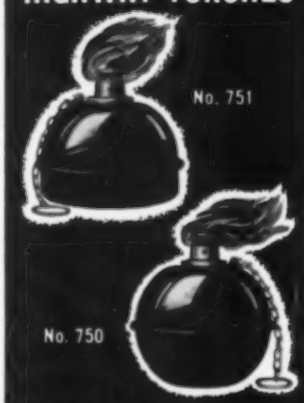
Name _____

Address _____

RADIATOR SPECIALTY CO.
CHARLOTTE, NORTH CAROLINA
RADIATOR SPECIALTY COMPANY OF CANADA, LTD

EMBURY
offers
Protection Plus!

Luck-E-Lite
HIGHWAY TORCHES



- Weather Guard Burner—stays lighted
- Cam-Lock Burner Hood—no threads to strip
- Easy to Fill
- Ring Chain—for easy carrying and placing
- Two models—Flat base or self-righting

For more Luck-E-Lite facts and nearest distributor, Write
EMBURY MANUFACTURING CO.
WARSAW, NEW YORK, U. S. A.

EMBURY
TORCHES & LANTERNS

and in any direction, the manufacturer points out, by following a recommended procedure. Based on over a year's successful field operation, the manufacturer claims the couplings and adapters are designed to be self-cooling—self cleaning. The tool's design keeps the hole in alignment and eliminate excessive vibration at maximum depth. They also point out that where user has his own steel shop, the sectional steel can be made on the job. Rock Bit Sales & Service Co., 2514 E. Cumberland St., Philadelphia 25, Pa.

20

Truck Mixer

A new truck mixer has been announced by the Transmission & Gear Co. Two models are available. One contains a Ford industrial engine, the other model incorporates the truck drive principle using a power take-off. It is 13 in. shorter than the engine equipped unit. The mixer has a 3 or 4 yd. capacity mixing drum, planetary type, reversing type

Transo Load Champion Truck Mixer

transmission and a large water tank. Its Transo direct drive in combination with a planetary type reduction unit mounts directly to the mixing drum. The mixer is equipped with a new type hopper closing door which completely eliminates the seal. A power operated chute adjuster is available as optional equipment. The extremely short overall length and lighter weight is claimed to provide greater maneuverability and handling ease. The Transmission & Gear Co., Dearborn, Mich.

21

Airport Paving Form

A new heavy-duty paving form manufactured by Blaw-Knox Division of Blaw-Knox Co., has been developed especially for airport paving to meet the requirements of thicker pavement slabs needed to withstand the greater concentrated wheel loads of heavy bombers and cargo planes. These heavy-duty, self-aligning paving forms are available in sizes above 12 in. and can be furnished in any height required by the specifications. They are made of ¼ in. steel plate of special analysis, with the width of the base equal to the height. The end of each 10-ft. section is reinforced by a heavy angle welded to the base and web, through which beveled steel pins slide into pipe guides, providing a connection that is simple, rugged, and fast operating, yet aligns the forms perfectly under all conditions and maintains that alignment during the paving operation. These steel pins cannot fall out, and are beveled for easy entry into the pipe guide. A secondary staking system is provided to give additional lateral support to the form in soft or sandy subgrades. A heavy, perforated steel bar supported by the stake pockets and welded to them, provides a rigid support for the ends of the pavement dowel bars. The spacing of the holes in this support and in the web of the form can be varied to meet specifications. Blaw-Knox Division of Blaw-Knox Co., Farmers Bank Building, Pittsburgh 22, Pa.

22

Sump Pump

A new small submersible 1/3 H.P. sump and all purpose pump announced by Lancaster Pump and Manufacturing Co., is

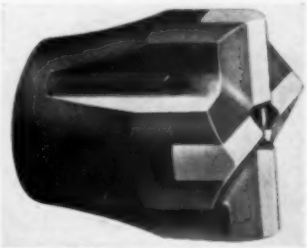
Lancaster Drain-Pak

an all bronze pump with stainless steel motor housing. It is of floatless construction. It weights 31 lb. and can be lowered to depths up to 15 ft. The maximum capacity is 3300 g.p.h. Lancaster Pump and Manufacturing Co., Lancaster, Pa.

23

Tungsten Carbide Bits

A new complete line of tungsten carbide bits has been added to the products of Brunner & Lay, Inc. The bits will be known as Brunner & Lay Rok-Bits. The bits are supplied in all standard sizes from 1¼ in. to 4 in. To meet all requirements, these bits are offered in the four-point cross type bit and in the two-point chisel type bit. Design features include full body absorption of impact inserts for proper absorption of impact and balanced air hole positioning for uniform high-efficiency air pattern in blowing. Internal threading of the bit prevents bottoming of the steel when proper drill steel is used, holding thread wear and damage to a minimum. Shoulder of the bit is accurately formed for



New Brunner & Lay Rok-Bit

DIETZ

NIGHT WATCH LANTERN

For SAFETY — a WARNING LIGHT, seen from *any* angle nearby or from long distances, the NIGHT WATCH is without equal. Optically correct prisms concentrate the light into a vertical "Pencil Beam" of great intensity. Many exclusive features. Very economical to buy and to operate. Burns 100 hours on a pint of kerosene.

By the makers of Dietz Lanterns and Highway Torches

R. E. DIETZ COMPANY
SYRACUSE 1, N. Y.

OVER A CENTURY AND A DECADE OF WORLD WIDE LEADERSHIP

full support by the shoulder of the drill steel, to maintain alignment and to transmit impact directly to the steel without strain on the threads. Brunner & Lay, Inc., 9300 King St., Franklin Park, Ill.

24
Snow Fighter

A new model Snow Fighter announced by Walter Motor Truck Co., is powered with a V-8 engine. This overhead valve V8 engine of 540 cu. in. piston displacement develops a full 200 h.p. at a moderate speed of 2600 r.p.m. The truck has a tractor-type transmission providing six forward speeds with single lever control, giving a fast high gear and powerful low gears for all emergencies, and with

New Walter Model ARB Snow Fighter

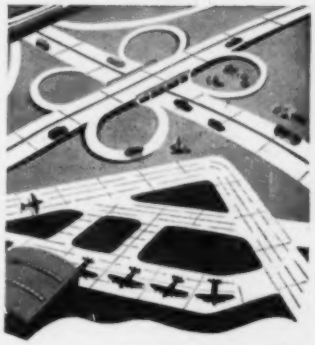
proper intermediate ratios for all operating conditions. The truck has the Walter four-point positive drive with correct automatic differential and driving action between all four wheels. The Walter suspended double reduction drive offers high ground clearance, less unsprung weight, low mounted springs, and provides great reserve strength and wear capacity. The hydraulic snow plow control system is engineered with the chassis, providing a clean, efficient, reliable plow control system. The gross vehicle weight of the truck is 32,000 lbs. Walter Motor Truck Co., 1001-19 Irving Ave., Ridgewood, Queens, Long Island, N. Y.

25
Protective Coating for Runways

A coating of plasticized synthetic rubber and tar blend has been developed by the Naugatuck Chemical Division of United States Rubber Co. for the protection of airfield runways and taxi strips from softening by jet fuel spillage. It is stated that the new material can also be used as an economical combination with asphaltic concrete in the lengthening of existing runways, or in new construction. The synthetic rubber and tar blend is unaffected by searing jet blasts, which range in temperatures from approximately 160° F. and 300° F., and higher. The blend also is said to have the stability to withstand high wheel loads, and it gives a densely graded, relatively non-skid surface. The new product "Surfa-Aero-Sealz," is mixed with selected tar cement in the hot melt phase, producing a homogenous mixture. It is shipped to construction sites in drums, tank cars or tank trucks, where it is mixed with aggregate by the regular hot mix plant procedure. It is laid with regular paving equipment, then rolled and compacted with tandem rollers. A coating of 1 in. to 1½ in. is applied to asphaltic concrete pavements. United States Rubber Co., Rockefeller Center, New York 20, N. Y.

26
Masonry Water Repellent

After years of research and comprehensive testing of masonry water re-



KEEP PAVEMENT JOINTS SEALED
...under *all* conditions

Don't let your concrete pavements run up unnecessary repair bills.

Keep destructive moisture and other foreign matter out of the joints with

*Flintseal** **Hot-poured joint-sealing Compound**

(Fed. Spec. SS-F-336a)

One application lasts for years and years. Flintseal holds its bond *firmly* and seals *positively* throughout cycles of hot and cold weather.

SEND FOR THIS NEW FOLDER

Describes and illustrates Flintseal . . . the rubber asphalt thermoplastic which assures *dependable* joint-sealing under all conditions.

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THE FLINTKOTE COMPANY, *Industrial Products Division*, 30 Rockefeller Plaza, New York 20, N. Y. Also offices at:

Atlanta • Boston • Chicago Heights
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Washington

In Toronto, Ontario: The Flintkote Company of Canada, Ltd. In London, England: Industrial Asphalts Company, Ltd.

FLINTKOTE
Products for Industry

*Reg. U. S. Pat. Off.

pellents, a new formula with a silicone base has been developed by chemists of the Ranetite Manufacturing Co. The new silicone base water repellent is for surface application to exterior, above grade masonry and is claimed to offer the following advantages: 1. Quick to develop repellency after application. 2. Versatile—performs well on most types of masonry. 3. Easy to apply either by spraying or brushing. 4. Readily applied at temperatures as low as freezing. 5. Highly effective against efflorescence. 6. Clear and invisible, causes no change in masonry appearance. Penetrates deeply to insure durability. Non-sealing of masonry pores, allowing the masonry to "breathe". Paintable, oil base paints adhere and do not impair the water repellency of the underlaying mortar. Ranetite Manufacturing Co., 1917 South Broadway, St. Louis 4, Mo.

WITH THE MANUFACTURERS & DISTRIBUTORS

Steelman New Koehring President. J. R. Steelman, formerly vice president in charge of sales, has been elected president of Koehring Co., Milwaukee, Wis., and its four subsidiary companies. He succeeds G. E. Long who will remain as chairman of the board of directors, a position he has held dually with the presidency. E. A. Brugger, formerly vice president in charge of production, has been elected vice president and general manager.

New Cleaver-Brooks Distributor. V. N. Harwood Co., 250 Delaware Ave., Buffalo, N. Y. has been appointed manufacturers representative for boiler equipment of Cleaver-Brooks Co., Milwaukee, Wis. Territory includes eight counties in western New York and four counties in northeastern Pennsylvania.

Lamb Made Assistant Manager. Pat Lamb, formerly district manager in western states and western Canada, has been appointed assistant manager of Lull Manufacturing Co., Minneapolis, Minn. A. L. Stains succeeds Mr. Lamb.

Faulkner Appointed Territory Manager. Henry M. Faulkner, district manager in the Allis-Chalmers Eastern Territory, has been appointed Southwest Industrial Territory Manager, with headquarters in home office, Milwaukee, Wis.

Assistant Sales Managers Appointed. Harold W. Newton and William C. Gifford have been appointed assistant sales managers by Barber-Greene Co., Aurora, Ill. Each will supervise a division of Barber-Greene's sales organization and will assist E. H. Holt, whose appointment as general sales manager was announced recently. Mr. Newton will be assistant sales manager of the Conveyor Division and Mr. Gifford will function as assistant sales manager, Machine Sales.

Sales Department Changes at Le Tourneau. Henry Cain, heretofore chief Washington representative, has been appointed district sales representative for Nebraska, Kansas, Missouri and Southern Illinois for R. G. Le Tourneau, Peoria, Ill. David W. Flint has been named active chief Washington representative and Jack McCann has been appointed assistant Washington representative. William Barry has been transferred to the Domestic Sales Department from the Government Sales Department. Darrell Abernathy succeeds Barry as special representative for the Government Sales Department, and parts coordinating position formerly held by Abernathy is now filled by John Tuntas.

Herman Miller Retires. Herman H. Miller, one of the country's leading compressor authorities, has retired after serving 50 years with Worthington Pump and Machinery Corporation, Harrison, N. J.

Wilder Elected Vice President. George C. Wilder, heretofore assistant to the general manager, has been elected vice president and assistant general manager of Macwhyte Co., Kenosha, Wis.

MANUFACTURERS' LITERATURE

27

Wire Rope Assemblies

A new catalog (Industrial Standards 5201) issued by Macwhyte Co., lists wire rope assemblies for machine parts and operating devices. Called "Macwhyte Safe-Lock Industrial Standards Wire Rope Assemblies," this new catalog illustrates and gives detailed specifications for wire rope with fittings permanently attached. Assemblies are used, for operating controls, as a part of machinery and equipment, and for slings and hoists. Macwhyte Co., Kenosha, Wis.

28

Road Machinery

A new catalog (Form 5110) illustrating and describing its complete line of equipment has been released by J. D. Adams Manufacturing Co. This skeleton-type catalog illustrates Adams motor graders at work on all types of jobs—road and street work, terracing, in coal strip mines, in the logging country, plowing snow, etc. The Adams TraveLoader is shown at work on summer and winter loading operations. Pull-type graders are also shown on representative jobs. Brief specifications and catalog views are included on all machines in the Adams line. J. D. Adams Manufacturing Co., Indianapolis 6, Ind.

29

Anti-Friction Bearings

The Anti-Friction Bearing Distributors Association has recently announced that the "AFBDA Bearing Maintenance Report," which has been published during the past year by the Association, will again be offered without charge during 1952 to men within industry as a service of the AFBDA and its members. Concentrating solely on the many and varied problems of maintenance of anti-friction bearings, the Bearing Maintenance Report has won acclaim from maintenance men everywhere as a practical, down-to-earth guide to bearing maintenance problems. The Anti-Friction Bearing Distributors Association states that the Bearing Maintenance Report will, in future issues, bring maintenance men the answers to many problems of bearing service which have rarely, if ever, been covered in any other publication. Copies of the "AFBDA Bearing Maintenance Report" may be obtained from the Anti-Friction Bearing Distributors Association, 1900 Euclid Ave., Cleveland 15, O.

30

Hardfacing Rods

A new wall chart, 17 in. by 26 in., which details the proper hardfacing rod for the job, is available from the American Manganese Steel Division of the American Brake Shoe Co. The chart divides welding into basic operations, under which are listed the equipment parts to be Amserated together with the recommended rod, available sizes, and preferred method of application. A fuller description of the uses of each rod appears on the chart. American Manganese Steel Division, 389 East 14th St., Chicago Heights, Ill.

31

Diesel Engines

Design and operation features of the Nordberg one, two and recently introduced three cylinder Type 4FS Diesel engines are illustrated and described in a new 12-page, two-color bulletin. Built for continuous duty or standby service, the Nordberg 4FS Diesel engines described in Bulletin 194 have a 4½ in. bore and 5¼ in. stroke and are of the four-cycle, vertical mechanical injection type. The units range from 10 to 45 hp within an operating speed range of 1200 to 1800 rpm. Nordberg Manufacturing Co., Milwaukee 7, Wis.

32

Power Sweepers

Wilshire power sweeper for municipal, industrial and commercial sweeping, illustrated and described in Bulletin S-101, are stated to effect considerable savings in sweeping costs. Comparative operating data are given in the bulletin on each sweeper as a guide to selecting the correct model and sizes for specific requirements. Wilshire Power Sweeper Co., 526 W. Chevy Chase Drive, Glendale 4, Calif.

33

Aircraft Cable

A new revised catalog of aircraft cable, terminals and assemblies has been released by Macwhyte Co. Complete specifications conforming with the latest military specifications are given for "Hi-Fatigue" control cables for all types of aircraft. Macwhyte "Safe-Lock" and "Socketype Terminals" are catalogued in conformance with government standards. In addition Macwhyte tie rods are listed, described and illustrated. Macwhyte Co., Kenosha, Wis.

34

Diesel Wheel Tractors

Circulars are available on the Models 125 and 150 M-R-S diesel wheel tractors. Model 125 has an International Harvester 4-Cycle diesel engine, valve-in-head type, with inbuilt gasoline conversion starting system. The engine horsepower (net at flywheel) at rated rpm is 125. The Model

(*Continued on page* 129)

SERVICE IS DUCK SOUP ON

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"Built to last" EQUIPMENT

Sturdy construction and finest craftsmanship make KYSOR Equipment easy on maintenance and simple to service.

Complete service instructions are available in KYSOR Service Bulletins such as those illustrated. Authorized KYSOR Distributors are also equipped to service all types of KYSOR SHUTTERS and Controls.

Please enclose shutter serial number when requesting service material or replacement parts.

KYSOR HEATER CO. - Cadillac, Mich.

FACTORY PARTS EXCHANGE PLAN

KYSOR maintains a rapid-service parts exchange department for customer convenience and savings. Exchange Plan includes Shutter-stats, Alarmstats, Pressurestats, Air Filters, Air Cylinders, Vacuum and Hydraulic Controls.

Write KYSOR, Cadillac, Michigan, giving parts serial numbers for parts exchange information.

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Check service information desired, clip to your letterhead and mail to KYSOR Heater Company, Cadillac, Mich. Service information will be promptly forwarded to you.

Air Control Shutters ☐ Vacuum Control Shutters ☐

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For Shutter Parts List add Serial No. _____

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Learn the advantages of a properly conducted, properly advertised auction from the firm of experience and which handles all details of the sale. Last year, 14 heavy equipment auctions conducted, all successful. Without obligation, call or write for full information and inspection—sales conducted throughout the nation.

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Let Roads and Streets help you efficiently, economically, quickly.

Save your time, your secretary's time, stationery and postage by letting us handle your information needs.

FIRST, fill in your name, title, company or government department, street address, city and state at the top of the card.

•

THEN—

A If you want information about any of the products advertised in this issue of Roads and Streets, enter the advertisements' page numbers and advertisers' names in section A of the card.

•

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Page ____ by _____ Page ____ by _____
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B

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3/52 RAS

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61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

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The Readers' Service Department of Roads and Streets is ready to help you now or at any other time, and as frequently as your needs may require. Do not hesitate to make full use of it; you will not be obligated in any way.

So, turn this leaf now and let us start helping you today.

Readers' Service Dept.
ROADS AND STREETS
22 West Maple Street
Chicago 10, Illinois

FOR SALE

1—Barber-Greene Asphalt Plants. Each one complete including 72" x 24' Madsen drier and dust collector and Barber-Greene Finishing Machine. The above to be sold as complete units only.
1—D8 Serial #1H8363 with 8S Caterpillar Dozer and 8R LeTourneau DDPCU.
2—D4s Serial #7J-0265 and #7J-0180 with LeTourneau DDPCUs and angledozers. Engines have 600 hours since complete overhaul. Both in excellent condition. One has new rail assemblies.
2—Cat 12 Patrols. 9K Series each with cab-heaters-lights-scarifiers-14' moldboards. One has electric starter.
2—Cat 12 Patrols. 7T Series each with cab-heater-lights-electric starters-scarifiers-14' moldboards.
1—L40 ¾ Cu. Yd. Lorain. Serial #2851. Waukesha 6M2 engine. Shovel stick new in 1951. Also has dragline boom.
1—62" x 24' Madsen Drier
3—Barber-Greene Bucket Loaders.
1 Model 42-3-60 disc type crawler mounted.
1 Model 522 on rubber tires.
1 Model 82H crawler mounted.
1—Kubit breaker. Small size—with or without power.
1—85 H.P. Madsen locomotive type boiler. 150# working pressure.
2—9 Wheel Bros pneumatic tired rollers. 1 wobble wheel. 1 straight wheel.
1—Comco pneumatic roller. Serial #063146.
We also have some 9, 12 and 13 ft. chip spreaders—Buckeye and Good Reads.

All the above is offered subject to prior disposition and on a rebuilt and guaranteed basis.

ALEXANDER CONSTRUCTION CO.
4641 Hiawatha Avenue, Minneapolis 6, Minnesota, DUpont 2304

FOR SALE

Seven DW-10 Tractors and Seven W-10 Wagons

Tractors: 98HP Diesel engines; tires 10.00 x 20 12 ply front. 18.00 x 24 16 ply rear. Wagons: 8½ cu. yd. struck. 11 heaped. Tires 18.00 x 24—16 ply.

All units above average condition. Will supply additional specifications upon request.

J. M. HUBER CORP.
HUBER, GEORGIA
Tel. Macon 5-4751

FOR SALE

MANITOWOC #3500 Hi-Lift Shovel. 2 cu. yd. New 1948. 45 ft. boom. 35 ft. stick. D17000 Cat. Diesel. Excellent. $37,000.00

KOEHRING #804 Dragline. Swamp Trucks. H-Gantry. Counterweight. 6LD 844 Buda Diesel Super Charged Diesel. 70 ft. boom. 3 cu. yd. Hendrix dragline bucket. 30 ft. extension. Rud-Matic Tagline. Excellent. $28,500.00. Okla. Consider rental purchase.

MARION #11150 ser. 8487. Dragline. Cummins L-60 Diesel. 90 ft. boom, 5 cu. yd. Hendrix bucket. Rebuilt. $64,000.00 Kansas.—Another one ser. #8299. Overhauled. Washington.

MARION-Ward Leonard 151-M. 7½ cu. yd. shovel. Rebuilt. $160,000.00. Nebr.

Shovel attachments:—New Bay-City #37 #65; Northwest No 25 #-4-5-6; Lorain #41; Bucyrus-Erie 15-B, 22-B, 37-B, 44-B. Lima #34, also backhoe; Lima #802 hi-lift. P. & H-A; #150; #555; #455; #655-A. Link-Belt LS-50. General #307.

Backhoe:—1½ cu. yd. 30 ft. capacity. Originally off Osgood. Can be made to fit other makes. A-1.

UNIVERSAL 293 Q. Twindual PEACEMAKER. 3-Stage Portable Crushing and Screening plant—rock or gravel. Jaw 18"x24". Apron Feeder. Twin Dual Rolls. 2½ deck vib. screen. Complete with all conveyors. Late model. $17,500.00—less than half factory price. Good condition.

ROGERS 18"x24" RB. Jaw with Apron Feeder. $3500.00. Smaller jaw crushers, some portable.

UNIVERSAL 20"x36" RB. Jaw. Like new. $5500.00.

INGERSOLL-RAND 315 cu. ft., 500 cu. ft. Diesel Portable Compressors. Good. $3000.00 and $4500.00. Rental purchase. Also smaller ones. Wagon drills.

GARDNER-DENVER Model: 420 cu. ft. D-13000 Cat. Diesel. Portable Compressor. Like new. 582 hours. $8500.00.

H-D #19. 1950. 11 ft. Garwood Dozer. 2-drum. New rollers. New pins and bushings. A1. $12,500.00. Rental purchase, if desired.

CLAMSHELL & DRAGLINE BUCKETS:—Have a good stock of new and used. Rental purchase.

Wenzel Machinery Rental & Sales Co.
2136 Jefferson Street
Kansas City, Mo.
Telephone: Harrison 0021

FOR SALE

VIBRATORS

4—Robbins 4 x 10 Vibrators, 2½ Decks but could easily be made 3 Deck.
1—Robbins 4 x 8 Vibrator, 2 Deck.

HOPPER CARS

25—15 ton Sanford Day Automatic Drop Bottom Cars with multiple latch arch bar truck. 4 wheels under each end. 18" wheels, 36" gauge. Sanford Day roller bearing trucks. Overall dimensions: overall length over bumpers 25'2", overall length inside 20' 11½", overall width 8' 10¾", overall height 6'8". Size of door, width 2' 9", length both doors 11' 9½".

SCALE

1—Fairbanks Morse truck scale, 39' platform, concrete deck.

GAVENDA BROTHERS, Inc.
352 South Second Ave.
CANTON, ILLINOIS
Phones 739 & 2438

FOR SALE

Caterpillar 12 Motor Grader	$4,000
Cat. 1-12 Motor Grader U Series	5,750
Cat. 2-12 Motor Grader	2,250
Cat. D4 Hi Lift 7 U Series	4,650
Gallion 102 Motor Grader	3,500
American D8 Motor Grader	1,575
Cletrac HG 42 with Dozer	975
Int. TD9 Hi Lift full Hydraulic	2,950
Cat. 70 Scraper like new	6,500
Cat. 60 Scraper like new	4,650
La Tourneau L.P. Scraper	3,675
La Tourneau L.S. Scraper	3,750
Hyster D4N Towing Winch	750
Alamite 4 reel Greasing Unit Comp.	875
New 1300x24 Grader Tires 8-ply Blemished Each	97.50

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FOR SALE

LIMA 604 comb—shovel & crane.
LIMA 1201 comb—shovel & crane
B. E. 37-B comb—shovel & crane.
P. & H. 2½ yd. shovel 1 yr. old.
P. & H. 1½ dragline 6 mos. old.
BROWNING truck crane. Rebuilt.
LORAIN 416 truck crane.
3—D8 CATERPILLAR dozers.
2—55 P. & H. Shovel and backhoe.
12—Crane booms, ½ to 2½ yd. cap.

THE KELLY EQUIPMENT CO.
1179 Gilbert Ave. Cincinnati 2, O.

FOR SALE

1—Huber maintainer, enclosed cab, good condition.
1—Gallon junior motor grader, good condition.
1—Insley crawler shovel, ⅜ cu. yd.
1—Universal truck crane, good working condition.
1—D1 Case tractor w/ White front end loader.

MAJOR EQUIPMENT CO.
Cambridge Ohio
Phone 46388

FOR IMMEDIATE SALE

(1) Page Steam dragline machine, Our No. 117—160 ton—100 Ft. boom—11" x 12" engine, as is, at our Plainfield, Ill. Plant $8,000.00, without bucket. Dismantling, loading and transporting to be paid by purchaser. Machine is now working and its condition is fair to good. Subject to prior sale.

CHICAGO GRAVEL COMPANY
1509 Fisher Building Chicago 4, Ill.

FOR SALE—Two—TD-18 Tractor Dozer. One—TD-14 Tractor Dozer. One—HD-10 Tractor with Dozer, One—HD-10 Tractor with PBU and Push Block. One—FD-Cletrac, 130 H.P. with Push Block. Two—D-9 Wheel Tractors. Three—W2 Sheepsfoot Rollers. One—Huber 10-12 Ton Roller. One—511-Adams Motor Grader. One—Cat-12 Motor Grader. Two—TL-20 Lorains with Backhoes. One—22B Bucyrus-Erie with Dragline Bucket. One—KR-11 International Tractor—27 Ton LaCrosse Trailer. Five—TS-300 LaPlant-Choate Motor Scrapers. One—Gross Convoy Grease Outfit mounted on 1½ Ton Ford Truck. Two—S-90 Bucyrus-Erie Hauling Scrapers. The above equipment is all in first class condition and priced to sell. Ready for work. Located at Edinburg, Indiana. Prices on application. Dealers inquiries invited. **MORRIS PROTZER, Contractor, Inc., 224½ N. Main St., Franklin, Indiana. Phones: 233, 131-R.**

WANTED
½ Yard Shovel
Mounted on Rubber
M. H. HUBBARD
205 Peat Street
Syracuse, New York
Phone: 747723

CRUSHERS: Gyratory 20", 30", 42", and 48". Nos. 12, 16, 5, 7½, 5, 5 Allis-Chal. and others.
JAW TYPE: 9x36, 25x40, 32x30, 40x48, etc.
CONE TY: Symons 3, 5, 4 and 5½'. No. 36 Telsmith. Also Kennedy 18, 25, 27 and 40. Traylor 1'6" and 2'6" TY. Newhouse 7, 10 and 14". Readman 24, 30 and 36" Impact. Allis-Chalmers Ty. H.
ROLLS: Allis-Chal. 72x20, 54x24, 54x30, 40x18 and 16x16. Pioneer 18x30. Universal 16x24. New Holland 24x16 and 16x16. McLanahan 18x24 and 18x30.
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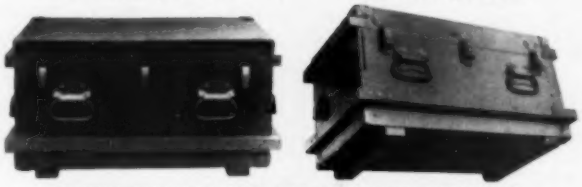

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313 W. 53 St. New York 19, N. Y.

FOR SALE

D-8 Caterpillar Tractor Serial 8R9946, Cat. DDPCU and tilt blade, excellent condition. $14,750. Lorain Model 80 Shovel 1¼ yard. Serial 10731, fine shape. $21,500. Both available inspection—Beckley, West Virginia.

Contact: BRUCE L. CAMPBELL
530 Linden, Oak Park, Illinois
Phone Village 8-4873

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$1200 for No. 7 Williams Jumbo Hammermill Crusher. This machine in working condition and priced almost at its value for scrap. Located on railroad siding, Enders, Nebraska.

Guy H. James Construction Co.
1016 First National Building
Oklahoma City 2, Okla.
Telephone REgent 91484

FOR SALE

Boom, 100', 4 Section for Bucyrus-Erie 54 B.S $50.00
Blade, LaPlant Choate, Model BM 4, 124" Overall $55.00
Mixer, Jaeger 7S, 2 wheel pneumatic 800.00
Mixer, Jaeger 11 S, 2 wheel pneumatic 1450.00
2 Earth Augers, 1—Buda Model H.B.J. (Hydraulic).
Quickway Model E, 30 ft. Dragline crane, mounted on truck.

WAYNE DEUPREE
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NEW GUIBERSON
RADIAL AIR COOLED MOTORS
PACKED FOR EXPORT WITH SPARE PARTS
REASONABLY PRICED

GENERAL TRUCK CO., INC.
CHARLOTTE, NORTH CAROLINA
PHONE: 8195

FOR SALE! HEAVY EQUIPMENT

1—80 Foot Heavy Duty Boom and Fairlead, last used on P & H 600.
1—Cubic Yard Dragline Bucket With Chain Hookups.
1—½ Cubic Yard Clamshell Rehandling Bucket.
1—½ Cubic Yard Digging Bucket.
1—8 x 16 Howe Jaw Crusher.
1—7 x 12 Jaw Crusher.
1—Insley K-12 Excavator With 40 Foot Boom and Back Hoe.
1—HD 7 Allis-Chalmers Straight Dozer With Side Arm Boom Attachment and Winch for Handling Heavy Pipe, Etc.

WOODWORKING EQUIPMENT

1—Carley Sawmill 8 to 10 Thousand Foot Capacity with 110 H.P. GMC Diesel Power Unit.
1—Never Been Used, New Newman Planer With 54S Knives; Also Center Match and Shiplap Side Heads.
1—Never Been Used, New Newman Circular Resaw.
1—Set Fully Automatic Electric Top and Bottom Knife Grinders.
1—Set Fully Automatic Electric Side Head Grinders.
1—Rubber Tired Log Wagon.
2—Rubber Tired Lumber Wagons for Yard Use.
1—International Tractor With Rubber Tires for Yard Use.

SMITH BROTHERS CONSTRUCTION & MATERIAL CO.

835 VALLEY STREET HOT SPRINGS, ARKANSAS PHONE 404

FOR SALE

Steel Stack, like new, 60' high x 41" I.D. ¼" plate, 3 sections.

Crusher, Link Belt, used 20" x 20" single roll.

Belt conveyor, used, good, 18" x 21' 4" centers, complete with troughing rolls and return idlers, steel frame.

Apron conveyor, 30" x 47', complete with chains, sprockets, rollers, rails, gear reducer and motor, unused.

Bucket chain elevator, link-belt, 28' centers, buckets 18" x 9½". Double chain. Steel casing 44" x 54". Unused. With motor and reduction gear drive.

Complete cement, rock crushing, sand & gravel plants. Kilns, Coolers, & Dryers designed, manufactured, and rebuilt.

Wanted Tractors, Bulldozers, Etc.

Webber Equipment Corp.

10 East 44th Street

NEW YORK 17, NEW YORK

FOR SALE

The following used equipment is offered for immediate delivery in whole or part. This equipment was used by a Southern W. Va. coal stripper who purchased it new.

Lima 1201 High Lift shovel with 2½ yard bucket, 18'11" crawlers 44" tread, 42' boom, 32' dipper stick type L, Cummins motor 1300 watt Kohler light plant Serial Number 32371777.
Link-Belt 1¾ yd. heavy duty Diesel operated shovel No. K370-2713.
2—Heavy duty LJ6W Mack dump body trucks, 25 ton capacity Serial Nos. LJ2D-31200 and LJ2D-31210, motor Nos. NH8 81459.
Allis-Chalmers RD10H bulldozer with Gar Wood hoist and blade attachment, heavy duty and fully equipped as above.
2—Horizontal drills—in good condition.
Lot of miscellaneous equipment used in connection with above.
All the above equipment is less than 18 months old with the exception of the Link-Belt & Allis-Chalmers which are 3 years old.

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We do a Nation-Wide business in

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We have Nation-wide reputation for efficient QUICKEST SHIPMENTS

All sizes Vulcan & McKiernan Pile Hammers & Extractors for rent—Shop Rebuilt

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D-2 Front End Loader 5U336	$ 3,200.00
D-4 Front End Loader 2T-7799	4,200.00
D-4 W LaPlant Choate Hyd. Dozer 5T925	3,400.50
D-4 Front End Loader 2T8242W	3,500.00
D-4 W/Athey Overhead Loader & Bulldozer	3,500.00
R-4 Hyd. Blade W/Hyster Winch 9G26525P	3,586.00
D-7 LaPlant Choate Blade 3T2782	7,760.00
D-7 LeTourneau Dozer & DDPCU	5,500.00
D-7 LeTourneau Dozer 4T6706	5,500.00
D-7 LaPlant Choate Angle Blade 7-M1574	4,750.00
D-8 LeTourneau Angle Blade & DD-PCU 8R8934	7,000.00
D-8 Cat Angledozer #25DDPCU	16,500.00

N.W. #6 Backhoe & Dragline Serial 13205 late Murphy diesel & 70' boom. Price $33,850, F.O.B., Arkansas.

Lorain Model 414 Truck Crane.

P & H 20-Ton Truck Crane

A. C. R. Co.

19615 Nottingham Rd., Kenmore 1-8000

Cleveland 10, Ohio

EQUIPMENT FOR SALE

1 80 D Northwest Shovel
1 Unit-1520 Truck Mounted Crane
1 D-7 Caterpillar Tractor Bulldozer
2 8R Caterpillar D-8 Tractor Bulldozers
1 1H Caterpillar D-8 Tractor Bulldozer
4 TU Caterpillar D-8 Tractor Bulldozers
1 Galion 103 Power Grader
2 15 cu. yd. LaPlant-Choate Scoops
1 M2400 Gradall
1 Apsco P125 Base Paver
3 C-3-7 LeTourneau Tournapulls
2 FM-2 Ingersoll Rand Wagon Drills
1 105 Jaeger Air Compressor
2 Double Drum Sheepsfoot Rollers
1 400 bbl. Blaw-Knox Cement Plant
1 T-3100 Blaw-Knox Aggregate Bin
1 Buckeye Chip Spreader 10 foot
1 Deluxe #1 Herman-Nelson Heater
1 Johnson ½ cu. yd. All Purpose Bucket
1 Blaw-Knox C-22 Concrete Bucket

Also various small tools—Vibrators, Chain saws, air tools, pumps, etc.

ALL IN GOOD CONDITION

County Construction Co.

25 E. Main Street

Phone: Carnegie 3242

CARNEGIE, PENNSYLVANIA

Northwest Equipment

FOR SALE

Available Northwest machines in all sizes as
Two 1952 Model 80-D shovels
f.o.b. cars and subject to prior sales. Every machine is in excellent mechanical condition and is a late model, and diesel powered.

Two 1951 Model 95 draglines 85 ft booms 2½ yd bkts
Two 1950 Model 95 draglines 80 ft booms 2½ yd bkts
Two 1949 Model 95 Draglines 80 ft booms 2½ yd bkts
One 1948 Model 95 dragline 80 ft booms 2½ yd bkts
Two 1951 Model 80-D shovels
Two 1950 Model 80-D shovels light plants
One 1948 Model dragline 80 ft booms 2½ yd bkts
Two 1951 Model 80-D shovel
One 1949 Model 80-D shovel
Two 1948 Model 80-D shovel-draglines 75 ft booms
One 1947 Model 80-D shovel-dragline 75 ft boom
One 1951 Model 6 shovel
Two 1949 Model 6 shovels
Two 1948 Model 6 shovel-draglines 60 ft booms
One 1947 Model 6 Clam-drag 60 ft boom 33" cats
One 1950 Model 6 shovel
One 1946 Model 6 pullshovel—rebuilt
One 1950 Model 25 pullshovel—28" cats
One 1949 Model 25 pullshovel—28" cats
Two 1949 Model 25 shovels
One 1949 Model 25 Sh-CS-D1 40 ft boom 28" cats
One 1948 Model 25 pullshovel 28" cats
Two 1948 Model 25 Clam-drag 40 ft boom 28" cats
One 1947 Model 25 Clam-drag-crane 50 ft boom 28" cats
One 1947 Model 25 dragline-pullshovel 28" cats 40 ft boom
Two 1947 Model 25 pullshovels
One Model 4 pullshovel. Attachments, 1946 Model

Many of the older and discontinued models are available in all sizes, and attachments (shovel—pull-shovel-dragline and clamshell) are ready for immediate shipment, except pull-shovel attachments for 80-Ds or 95s. We specialize in Northwest equipment and will mail our complete list upon application. It covers eighty-five machines plus attachments.

J. C. French Company

226 Berry Parkway
PARK RIDGE, ILLINOIS
Tel. Talcott 3-4927

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100KW G.E. 3 ph.—Hercules Diesel
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30KW L.A. 3 ph.—Caterpillar Diesel.
25KW G.E. 3 ph.—Buda Gasoline.
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Send for List—Sizes 350 Watt and Up

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501 - 30TH AVE. S.E.
MINNEAPOLIS 14, MINN.

EQUIPMENT BARGAINS

1—Manitowoc 3500 stripping shovel D-1700 Cat. Diesel, 45' boom, 34 stick, 2 cu. yd. bucket.....$31,000.00

2—Allis-Chalmers HD19 tractor with Baker hydraulic dozer.....$11,000.00

3—Two and three decks 4 x 10 gyro set vibrators, $500 and $1300 each.

1—6" Gorman Rupp water pump and 30 HP Westinghouse motor. New involute and bronze impeller.....$1,000.00

2—McCarthy hydraulic sidewall drills, excellent condition .....$2,300 each

1—Coal crusher Model 385, American Pulverizer Company $2,250.00

1—75 HP Electric Motor.....$750.00

1—50 HP Electric Motor.....$500.00

1—30 HP Electric Motor.....$300.00

1—Fairfield new car unloader with 5 HP motor $900.00

1—Barber Greene 24" x 30' Model N Belt Conveyor with 5 HP motor $500.00

1—80D dragline boom tip section..$750.00

1—13,000 gallon high pressure tank, 8' diameter, 35' long.....$1,300.00

1—Hartzog coal drill.....$500.00

2—Willys Jeep $300.00

1—300 amp Lincoln Welder driven by Ford 95 HP engine on Ford 1½ ton truck chassis $650.00

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805 East Vantrees

WASHINGTON, INDIANA

Telephone 2395

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Present openings in states between Mississippi and Rockies.

Write details of your experience, salary desired, snapshot self, to

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Plymouth 35-ton gasoline locomotive, std. ga. Universal 18"x36"; r.b. jaw crushers, rebuilt (3); Nordberg 36"x48" jaw crusher; 16", 30" gyratories. Pioneer 205W gravel washing, screening plant. Blaw-Knox 400 bbl. and 100-ton cement bins. Walking draglines, 3, 5, 6, 7, 12 yds. P&H 255A truck crane, 20-ton Mack truck. Wash. Iron Wks.-Marion elec. Whirley gantry crane. Shovels, draglines, cranes: 1¼ to 7½ yds. Euclid and Mack trucks, 15, 22, 32 tons.

H. Y. SMITH CO., 828 N. B'way, Milwaukee 2, Wis.

FOR SALE

One Manitowoc Model 3000B Special Shovel Attachment

Brand New—Never Used—Complete with 27' Boom, 18' Stick and 2 Cu. Yd. Dipper Assembly.

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303 Chapman Street Providence, R. I.

FOR SALE—CEDAR RAPIDS 1947

JUNIOR TANDEM PORTABLE GRAVEL PLANT

With 1036 Roller Bearing Jaw Crushers (New Rollers and New Jaw Crushers). Caterpillar D8800 Power Unit. Used Less than 3000 Hours.

PRICE: $27,500

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Shovels Draglines Cranes
Every one a "BEST" Buy

4 Euclid Model 34FD rear dump quarry units, Cummins H8600 engines. Excellent condition.

1 Used LORAIN Model 75D 1¼ cu. yd. Shovel complete except for engine, at a bargain price. Fair condition. Excellent for gravel pit.

New Wayne Crane ½ cu. yd. dragline.

1 Rebuilt Lorain Model 40A ⅜ cu. yd. dragline, 35' boom, powered with Waukesha SRK engine. Excellent condition.

Wagnermobile Duo-Way forklift truck, fully reconditioned, 16,000 pound lift capacity, price $4,750.00.

5 KW 60 cycle 120 volt alternating current gasoline electric generator sets equipped with automatic voltage regulators. NEW at used prices.—$750.00 each.

Shovel Front attachment, Bay City Model 20 ¾ cu. ft. chain crowd type. Fair condition. $450.00.

Shovel Front Attachment, General ¾ cu. yd. chain crowd type, practically new. $1,750.00.

Shovel Front Attachment, Bay City Model 52, 1¼ cu. yd. with Esco 1¼ cu. yd. dipper, as good as new. A bargain, $3,500.00.

2 Caterpillar D8 Tractors, 8R Series Complete with DDPCU and 2 Wooldridge Model TCH Scrapers. Excel. Cond. Throughout including Rubbers. Priced Below Ceiling. Complete lot F.O.B. Denver Colorado, $35,000.00.

American Model 25-IG Moist, Rebuilt. Guaranteed.

New Joy 315 cu. ft. portable compressor, Caterpillar Diesel power.

Complete line of new Joy Compressors, air tools, hoists, pumps, clamshell and dragline buckets, wire rope, crane blocks and sheaves, riggers shackles, concrete vibrators, and miscellaneous supplies, available from stock for immediate delivery.

CONSTRUCTORS EQUIPMENT CO.
3707 Downing St. Denver 5, Colo.
Phone ALpine 3474

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PIONEER 1536 roller bearing jaw crusher, A-1 condition throughout $4,450.00

EMMETT C. WATSON CO., INC.

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TROJAN WITH CAB, SCARIFIER AND 18" REAR TIRES. 1948 MODEL BUT UNUSED. BARGAIN.

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One large industrial property for sale or lease, centrally located between Detroit and Chicago, with railroad siding, electric power, lake front, good roads to Highway 112, steel and concrete buildings with cement silos, ideal location. If interested we will give full details.

One portable Osgood crane.

One 70 HP diesel type engine.

One belt elevator.

Six mechanical oil burners-Iowa type.

One Reeves speed reducer with motor.

One F.B. Sturtevant Fan size 95.

OLLIE E. LAWRENCE
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RECONDITIONED EQUIPMENT

1—101 Gallon Motor Grader
1—Adams 51 Motor Grader
1—A. C. Gas Motor Grader
1—Cat. # 10 Motor Grader
2—10-Ton 3 Wheel Huber Rollers
1—105 Sullivan Compressor
1—105 Jaeger Compressor
1—½ Yd. Clamshell Bucket
1—6" Jaeger Pump
2—New 115 Smith Concrete Mixers

CENTRAL SUPPLY & EQUIPMENT CO.

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TRUSSES FOR SALE

42 wood, bowstring trusses, temporarily used for construction of heavy, 3 span, arch bridge, are now offered for sale. Trusses are finely fabricated, with laminated upper chords, complete with all bolts, ring connectors and steel gusset plates. Suitable for permanent use in auditorium, garage, school, etc. There are 14 trusses at 83 feet, 21 at 46 feet and 7 at 42 feet. Write or call

M & M CONSTRUCTION CO.
Bar Harbor, Maine

EQUIPMENT FOR SALE

Bargains in Scales

1—20 ton Fairbanks 10' wide 20' long ..... $ 500.00
1—50 ton Fairbanks 10' wide 35' long 1500.00
1—50 ton Fairbanks 10' wide 45' long 1600.00
1—100 ton U.S. 10' wide 50' long 1900.00
1—6 wheel Brockway 10 yd. dump truck, 1200x20 tires. Make excellent truck for mounting heavy truck crane.
1—Mack Dump truck 10 yd. 1000x20 tires.
1—Fruehauf Dump trailer, 15 yd. 1000 x 20 tires.
1—300 amp. Lincoln welder.
1—¾ yd. Koehring Shovel and Dragline.

Wanted

P & H 255 Shovel front, complete ¾ yard.

F. W. Herkel Construction Company
MURPHYSBORO, ILLINOIS
Telephone 1326

FOR SALE

1¼ yd. Manitowoc Speedcrane. 2000-B 65' boom
10 ton Unit 1020 Motor Crane
2½ yd. Northwest 80-D Shovel-Crane '49
60 HP American 3D Gasoline Hoist
1½ yd. Owen Type S clamshell
5 ton Insley steel stiffleg derrick
40 HP New vertical boiler. 100 lbs.

MISSISSIPPI VALLEY EQUIPMENT CO.
515 Locust St., St. Louis 1, Mo.

FOR SALE

Manitowoc Crane, Model 2000-A Serial #3165, equipped with 100 foot boom and 20 foot jib. Also 1¼ yard shovel front complete; Fairleads, etc. This machine has had extremely limited light usage only and is in excellent mechanical condition.

Will Sell on O.P.S. 105 Ceiling

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Dependable well trained crews available on short notice. Auger type Jeep or truck mounted drills assure Economical prospecting of Clay—Phosphate—Minerals—Sand and Gravel fields.

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Gardner-Denver Steam, 10x3x10
Dean Brothers Steam, 6x4x6
Marlow Self-Priming Centrifugal, 4"
Two Marlow Self-priming Centrifugal, 6"
Two Istrouma Gravel, 6"

AIR COMPRESSORS

Chicago Pneumatic Diesel, 315 CFM on steel
Chicago Pneumatic Diesel, 500 CFM on rubber
Worthington-Laidlaw Electric Stationary, 500 CFM

STEAM HOISTS

Lambert 8½x10, 9000 lbs., double drum
Mundy, 9x14, 12,000 lbs., double drum
Lidgerwood, 10x12, 15,000 lbs., double drum
Clyde, 9x10, 10,000 lbs., 3 drum

MISCELLANEOUS

14 cu. ft. Ransome Pneumatic Concrete Placer
Ransome-Grouter
Decompression Chamber, 90 lbs.
Lima Model 550 Erection Crane
Bucyrus Erie, Model 37B Dragline
International, Model TD14 Tractor, bare
AC Superior McCully 13" Crusher
Telsmith 46B Crusher

Texas Railway Equipment Company
P. O. Box 2002 — Phone Preston 7168
Houston, Texas

FOR SALE

1—1949 D-7 Dozer w/front mounted cable control. Serial No. 3T9556.

1—1948 D-7 Dozer Serial No. 3T8196 DDPCU.

2—1950 LF210 International Heavy Duty body, Tandem drive.

1—1950 ¾ yd. Insley Dragline, Model L, 40 foot boom, fairlead, swamp pads, diesel power, like new.

1—No. 12 Caterpillar Motor Grader Serial No. 8T81, scarifier, cab, lights, 100 H.P.

G. H. LINDEKUGEL & SONS
SPENCER, SOUTH DAKOTA
PHONE: 72

FOR SALE: Two used dipper stick attachment complete for Lima ¾ yd. Paymasters also back hoe for one attachment.

FOR SALE: One used 150 H.P. stationary fire tube boiler complete with gas burners and automatic controls.

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COLLOID MILLS

1—Charlotte Colloid Mill
1—Hatt-Dussek Colloid Mill
SUITABLE FOR MAKING
ASPHALT EMULSIONS
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IMMEDIATE DELIVERY

"Caterpillar" D-4 w/dozer, clean.
"Caterpillar" D-4 w/Traxcavator A-1 condition.
Adams 414 Diesel motor patrol. A-1 condition.
1—Allis-Chalmers Model HD7W tractor w/Gar Wood bulldozer.
1—Allis-Chalmers Model B tractor with mower.
1—"Caterpillar" Model 212 motor grader.
1—Huber maintainer, good condition.
1—Gar Wood Model 508 scraper.
1—P & H Model WN300 portable welder.
1—Bros Model SG-55 skid mounted steam generator.
1—Allis-Chalmers HD7W and Gar Wood hyd. angle dozer.
1—Allis-Chalmers Model HD10W w/Baker Hydraulic Dozer.
LeTourneau 3½ cu. yd. scraper. Very clean.
1—Novo traffic line marker.
1—Titan chain saw.

ILLINOIS ROAD EQUIPMENT CO.
1310 E. Jefferson St.
Springfield, Ill.
Phone 2-7709

FOR SALE

10-ton General Model 307 Self-Propelled Crane, gasoline powered, 60-foot boom, $11,000.00.

G. T. SMITH
Welding Shipyards
Box 1860
Norfolk 1, Virginia

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The following equipment is available for immediate sale on a where-is as-is basis, subject to prior sale. All equipment is available for inspection at location shown.

Tractor, Model D-8, Serial 1 H-9159. Includes: Model 25 Two Drum Power Control Unit, Serial 9D2918, Push Block, Roller Guards, Crank Case Guard. Location—Great Falls, Montana.

Scraper, Model W, Serial S-5873 WB. Dual 18:00 x 24 Tires, front and rear. Location—Great Falls, Montana.

Scraper, Model W, Serial S-5858 WB. Dual 18:00 x 24 Tires front and rear. Location—Great Falls, Montana.

Scraper, Model FP, Serial S-8111 FPSA. Single 18:00 x 24 Tires front; dual 18:00 x 24 Tires rear. Location—Great Falls, Montana.

Trenching Machine, Ladder Type Parsons 235, Serial 1384, Motor, Wisconsin Gasoline Model JK, Serial 268855. Location—Hungry Horse Government Camp, Montana.

Shovel, Northwest Model 20, Serial 4814-2779B. Motor, Wisconsin Gasoline Model L3, Serial 28869. Special Attachments: 30 Ft. Crane Boom, ½ Cu. Yd. Shovel front end bucket, ½ Cu. Yd. Backhoe. Location—Great Falls, Montana.

Plant, Concrete Paving, Koehring 21E. Location—Great Falls, Montana.

Sedan, 4 Door Cadillac, Model 46-62, Hydromatic Drive, Seat Covers, Radio, Heater. Location—Great Falls, Montana.

Trailer, Semi, Double Drop, 50 Ton Capacity, Olson, Serial 1083. Length, 34' 6", Outriggers, Hyster-Larison axel, eight 11:00 x 20 Tires. Location—Great Falls, Montana.

Rollers, Tandem, Steel Wheels, converted to gasoline power. There are two rollers: one powered by Chevrolet Truck Motor and one powered by International Industrial Engine. Location—Great Falls, Montana.

Plant, Standard Asphalt Paving, 3000# Batch Type, with vibrating screens. Less: Power, boiler, dust collector. Vibrating screens are in Great Falls, Montana; Plant at West Glacier, Montana.

S. BIRCH & SONS CONSTRUCTION COMPANY
P. O. Box 1926
GREAT FALLS, MONTANA
Phone 3286

GENUINE PARTS

LeTourneau and Galion

Large Quantity

SPECIAL DISCOUNT

Write—Wire—Phone

GILL EQUIPMENT CO.

P.O. Box 67, Station "E"
1281 LaFrance St., N.E.
Atlanta, Georgia
Phone: ALpine 5695-6-7-8

FOR SALE

Wood Roadmixer, Model 48, S/N 105 $7,000.00

Wood Roadmixer, Model 54, S/N 134 $9,000.00

Allis Chalmers Motor Grader, Model AD-4, S/N AD-4-2116 $8,000.00

Rome Motor Grader, Model 404, S/N 404-941 $5,000.00

Seaman Pulvi-Mixer, S/N 72-39-1 $2,200.00

ALL FIRST CLASS CONDITION

MATHY CONSTRUCTION CO.
508 HOESCHLER BLDG.
LA CROSSE, WISCONSIN

Miscellaneous Items of Construction Equipment For Sale

All Located in the Two Carolinas. Will rent with purchase options to qualified parties.

2—Koehring 34 E Dual Drum Pavers with GMC Diesel Engines
2—RB Power Subgraders 20' to 25'
2—Blaw Knox Concrete Spreaders 20'-25'
1—Koehring Longitudinal Finisher 20' to 25'
2—Blaw Knox Model XC Finisher 20'-25'
1—Butler 250 Barrel Bulk Cement Bin with batcher
1—Barber Green Asphalt Finisher
4000 Ft. Blaw Knox 9" x 10" Forms
5000 Ft. Heltzel 9" Road Forms
Caterpillar D-6 with Traxcavator
Model 54 Wood Roadmixer
Lucey 104 Horse power Boiler
Cleaver Brooks 100 Horse power Boiler
Hopkins Low Pressure Burners with Electric motor
Forty Thousand Gallon bolted steel tank

BALLENGER PAVING COMPANY
P. O. Box 927
Greenville, South Carolina

FOR SALE

KOEHRING CARGO CRANE, 10 - 28, rubber tires, hydraulic steering, telescopic boom, self propelled, full swing boom, excellent cond.

NEW CATERPILLAR D13000, hd radiator & clutch, w/outboard bearings & tail shaft assembly, electric starter, steel canopy & mtd. on steel skids.

SHOVEL FRONT, 1½ yd., 90% new, complete chain crowd, straddle sticks, hd rock bucket & all lagging & chains.

DRAVO HEV-E-OIL HEATING UNIT, large capacity, 1,250,000 BTU, complete with large hd oil burner. All automatic controls, 4 suction fans powered by 3 HP mtr., & one 36" discharge fan powered with 7½ HP mtr., unit is near new and ready.

MULTI-FOOTE PAVER, new type, complete with skip & discharge bucket & powered by Hercules 6 cyl. engine. Overhauled and very clean. Priced to sell.

REPUBLIC SALES
2980 Auburn Boulevard
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Phone 9-2843

FOR SALE

Model 160 Rex pumpcrete machine complete w/ 113 sections of pipe $10,250.00

Two gasoline driven 14' concrete dump buggies. Each $1,000.00

Series 8T4, 1949 Michigan truck crane complete w/ ½ yd. clamshell and dragline buckets, 50' sectional boom, remote control out riggers, counterweights, etc. $18,000.00

Minneapolis-Moline industrial tractor w/ hydraulic loader, ¾ yd. bucket $2,550.00

Johnson Lo-Bin trolley batcher with partition and weigh beams $1,700.00

MIDLAND CONSTRUCTORS, INC.
222 WEST ADAMS ST.
CHICAGO 6, ILL.

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INTERNATIONAL CRAWLER PARTS

$300,000 Stock
Government Surplus
New Parts
International
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Drott, 10 foot reversible blade, hydraulically operated, special detachable hitch. Like new—used only six hours. Priced at $450.00 f.o.b. Milwaukee.

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All sizes clam and drag buckets

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PORTABLE WELDERS

300 Amp. Hobart-Chrysler Engine, completely rebuilt —Guaranteed.

Skid Mounted $700.00

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1—Lorain 82, 2 yd. combination backhoe, dragline and shovel attachments. Completely rebuilt, equipped with Cat. 13000 engine.
1—Bucyrus-Erie, 37B, 1½ yd. combination, backhoe, crane and shovel attachments; equipped with Cat. 13000 engine.
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1—LeRoi air compressor, Model 600 with Murphy Diesel engine. Both units five months old.
1—Schramm air compressor, 315 c.f. with Diesel engine, mounted on four steel wheels.
5—Oliver farm tractors, wide gauge on Caterpillar treads. Five months old.
1—Crescent Coal Washer, New. Will handle 90 tons per hour. Complete with new Shaker screens and motors.

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1—5-B Bucyrus-Erie stripping front.
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1—820 Lorain, 2 yd. backhoe attachment.
1—88B Bucyrus-Erie, 1½ yd. backhoe attachment.
1—Bay City crane boom, 65 ft.
All above attachments like new and complete.
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The services of a top flight mechanical engineer with practical experience are permanently required by a large and progressive organization in Montreal, Canada. The man we are looking for should be familiar with all types of roadbuilding and commercial stone quarrying machinery and equipment, and have a knowledge of the operations of quarries, asphalt and ready-mix concrete plants. It is suggested that only those with practical experience in similar fields reply to this advertisement. Give age, details of experience, references and state salary expected. All replies will be treated in strict confidence. Box 1082, Roads and Streets, 22 W. Maple St., Chicago 10, Ill.

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STEAM ROAD ROLLER
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Also interested other items of steam industrial, railway, etc. machinery. The older the better. Not necessary be in operating condition as wanted for museum purposes.

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PORTABLE LOCOMOTIVE FIRE BOX
75 to 110 HP 150# ASME Code. New tubes and equipped with steam automizing oil burners.

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D 6 Cat., 5 U series, wide ga. hydraulic straight blade, cool rake, Lawrence carryall trailer, 3 ton Dia. T., all in top shape. $10,000. Call or write

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CATERPILLAR JUNIOR CRAWLER TRACTOR
Licensed by Caterpillar Tractor Co.
Also JUNIOR TOW CAR with Electric Motor. Childrens vehicle sensational Catalog free.

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BOX 312-X, MYSTIC, CONN.

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1—N.W. Shovel
2½ c.y. Model 80-D
New late '46. Used 2½ years.
Serial Number 8931

1—N.W. Shovel
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New in '46. Used lightly.
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Both machines in excellent Condition

Williams Construction Co.
Box 145, Baltimore 20, Maryland
Telephone Essex 1310

TRUCKS WANTED

Highest dollar value paid for new and used trucks and all kinds of used equipment. All types of truck equipment bought and sold, including war surplus. Write, phone or wire:

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VANDEVENTER AUTO SALES
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Steam Pile Hammers and Extractors
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N.W. Model 6 Shovels—Link Belt No. 570 44-B Others.
5—6FD End Dump Euclids—3—27FD End Dump Euclids—6—28FD—End Dump Euclids—16—18 yd. bottom Dumps—9—25 Yd. Euclid Bottom Dump Trucks—12—25 Yd. Bottom Dump Euclids without Tractors.
Jaw Crushers—48"x48"—42"x49"—42"x36"—24"x36"—18"x36"—36"x15"—36"x12"—48"x16" — Symons Cone 5½'-4'-3'-2'-30x40 Dixie Hammer Mill—14" Newhouse Gyr. 4' TY Traylor—14" McCully—48" Gyrospheres—16" McCully.
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STANLEY B. TROYER
Theatre Building Crosby, Minnesota

FOR SALE—SCRAPER

Model 625 Gar Wood 19 to 24 yd., new August 1950, only used 1800 hours.

J. P. Dillard
P. O. Box 9186.
Richmond 27, Virginia

(Continued from page 116)

150 has a Cummins NHB 1-600 4-Cycle diesel engine, valve-in-head type (Optional power International UD-18A engine). The engine horse power peak, (on Cummins engine) at rated rpm is 200. Both tractors are equipped with the M-R-S exclusive weight transfer which is claimed to give greater tractive ability. Specifications for the tractors are given in these circulars. M-R-S Manufacturing Co., P.O. Box 336, Flora, Miss.

35
Heavy Duty Trailer

The new La Crosse heavy duty tilt platform trailer is covered in a circular. Specifications and a table of dimensions for three models having capacities of 14, 18 and 22 tons are included. The trailers are equipped with "walking beams" supporting the axles to provide maximum oscillation of each wheel for equal load distribution on any type road. Two double-acting hydraulic cylinders cushion the trailer platform when it is being tilted with or without a load. La Crosse Trailer Corporation, 418 Gould St., La Crosse, Wis.

36
Diesel Engine

A booklet published by the Detroit Diesel Engine Division of General Motors, covers various design features of the GM 2-cycle diesel engine. It includes action photographs of installations in the construction, transportation, marine, mining, oil well drilling, agricultural and industrial fields and a map showing the Division's widespread sales and service facilities throughout the country. Detroit Diesel Engine Division, 13400 W. Outer Drive, Detroit 28, Mich.

37
All Hydraulic Hydrocrane

A 2-color 24-page booklet issued by Bucyrus-Erie pictorially illustrates its Hydrocrane's versatility. The more than 100 illustrations show the machine with its many attachments placing tanks and pipe; digging, trenching and back-filling; hoisting and erecting; loading, unloading and stockpiling; and cleaning catch-basins, removing snow and stumps and cleaning up in quarries, mines and public streets. Bucyrus-Erie Co., South Milwaukee. Wis.

38
Diesel Tractor

A close look at mechanical features is provided in a new catalog (Form No. 30284) entitled, "Caterpillar" Diesel D2 Tractor. Subject of the catalog is a 32 drawbar horsepowere machine with many applications in construction, agriculture, logging, mining and other fields. Part-by-part, the catalog explains how the machine is built, what it's like and how it performs. Typical jobs are shown, along with reports from actual D2 tractor owners. More than 60 pictures are included in the 32-page booklet Caterpillar Tractor Co., Peoria 8, Ill.

39
Electrical Wires and Cables

A new 52-page engineering catalog on its line of electrical wires and cables for the coal mining industry, published by the electrical wire and cable department of United States Rubber Co., includes complete performance and specification data on insulation and jacket compounds, portable cords and cables with a voltage

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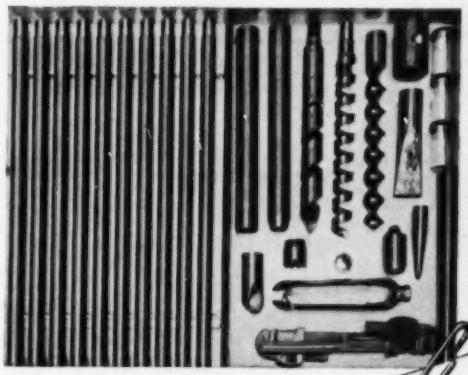
Everything you need for accurate sub-surface information



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COMMENT
from the BUTLER ENGINEER

H-Bomb Baby Born at Butler Bin

I'm kind of a proud papa these days. Not to the point of stuffiness I hope; just walking around in a genial glow. But the baby *is* terrific and I simply have to tell you about him!

He's the control system we designed and built for the super-super automatic, completely interlocked, push-button operated Butler Central Mixing Plant which will pour concrete for the H-Bomb plant.

That baby was full grown at birth. Here's what he does:

He offers a choice of 5 predetermined batches at the turn of a selector knob. Hit push-button and batch starts. Filling gates open. Aggregates, cement and water flow until they reach exact weight. Each of 7 dials prints record of batch. Lights flash when balance is reached. Nothing can go wrong for it's all interlocked against every possible sin of omission and commission. A chimpanzee just hitting push buttons at random could turn out nothing but the right batch. Much more to tell but no room. Anyway, everything's as automatic as a trip to hell.

I'm afraid I stretched a point when I claimed sole parenthood. It always takes more than one to produce a baby. Here at Butler Bin all of us exchanged cigars at the birth for really everyone had a part in the conception. Sounds immoral, but you know what I mean.

Yours for that ounce of H-Bomb prevention,

The Butler Engineer

BUTLER BIN COMPANY
WAUKESHA, WISCONSIN

P.S. Want to see pictures of our baby? We'll be proud to send 'em. Just ask!

rating up to 5,000 volts. Also included are complete data on shielded portable cables, welding cables, bore hole cables, mine power cables and miscellaneous mine equipment such as blasting wires, miner's lamp cord and mine telephone cable. Engineering data on splicing and patching, current carrying capacities, conductor resistance temperature correction factors and formulae for determining amperes are also incorporated in the booklet. R. H. Turner, electrical wire and cable department, United States Rubber Co., Rockefeller Center, New York 20, N.Y.

40

Feeders

A new 20-page booklet covering its complete line of manganese steel feeders for quarries, mines and cement mills has been published by Pioneer Engineering Works. The booklet explains in detail the physical details of these feeders and gives operational data including capacities, horsepower and dimensions enabling the proper selection for every type of installation. Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn.

41

Welding Rod

Ranite "C-X", a new hard-surfacing welding rod and a new method of hard surface overlay for millhammers and like applications, have been announced in Bulletin C-X released by Rankin Manufacturing Co. Ranite "C-X" is a new formula claimed to exhibit exceedingly fine wear resistant properties when properly applied. Rankin Manufacturing Co., 3072 West Pico Blvd., Los Angeles 6, Calif.

42

Concrete Form Clamp

The Krueper taper-tye concrete form clamp is illustrated and described in a circular. Advantages claimed for clamp include: Fast installation and adjustment; Easily removed from concrete because of true taper; no reassembly required at beach after stripping; ready for reinstallation as soon as removed from concrete; eliminates threaded tie rods; eliminates twisting and unscrewing of rods imbedded in concrete; one rod will tie up walls from 6 in. to 14 in., using standard lumber. H. J. Krueper Co., 535 South Clarence St., Los Angeles 13, Calif.

43

Snow Fighter

Bulletin SF-45 contains illustrations, descriptions and specifications of the new model Walter snow fighter. This truck has the Walter four point positive drive and is powered by a V8 engine developing 200 h.p. The gross vehicle weight is 32,000 lb. Walter Motor Truck Co., 1001-19 Irving Ave., Ridgewood, Queens, Long Island, N.Y.

44

Heat Machines

The Fageol heat machines are illustrated and described in a new 6-page circular. These machines are independent, self-controlled portable heating units, utilizing the most economical methods of heat transfer and direct heat circulation. Model PW-140 which is stated to be preferred by contractors has a heat output of 140,000 B.T.U. per hour. (No flue or chimney required.) This heat

SAUERMAN CRESCENT SCRAPER

Here is the popular lightweight model Crescent scraper bucket used for ordinary excavating. Crescents are built in four other models and fifteen sizes ranging from 1/3 to 15 cu. yd.

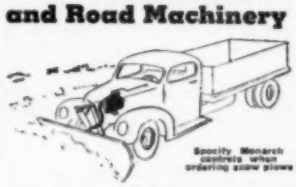
On thousands of earthmoving jobs, Sauerman Scraper machines equipped with the unique Crescent bottomless bucket, are cutting costs in digging, hauling and dumping almost every kind of material.

A Crescent scraper bucket penetrates tough materials with ease, gets a full load quickly, hauls this load at speed of 400 to 600 f.p.m.—all with economical use of power.

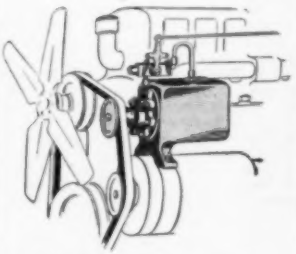
Write for illustrated catalog

SAUERMAN BROS., INC.
588 S. Clinton St. Chicago 7, Ill.

POWER HYDRAULICS for Snow Plows and Road Machinery



Specify Monarch controls when ordering snow plows



- Clutch operated (Optional)
- Thousands in use
- Fan Belt or Electrically Driven
- Fit All Trucks

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322 North Front Ave.
GRAND RAPIDS 4, MICHIGAN

machine is used by contractors on buildings under construction, and for thawing frozen ground, preventing concrete from freezing and for preheating construction equipment. Fageol Heat Machine Co., 5725 Mt. Elliott Ave., Detroit 11, Mich.

45
Wrought Iron

"Proof by Performance" is the title of an illustrated eight-page booklet released by A. M. Byers Co. The publication describes, in a non-technical manner, a number of installations in which wrought iron gave outstanding service over long periods of time. A. M. Byers Co., Clark Bldg., Pittsburgh 22, Pa.

46
Batch Weight Control

The Hardy batch weighing equipment used in the construction of the New Jersey Turnpike is illustrated and described in a four page circular. This is a fully automatic batch weight control. It is operated electronically, without the use of photo electric cells. Hardy Scales Co., 5701 Atlantic Blvd., Maywood, Calif.

47
Converting Beam Scale

How to convert a beam scale to a modern over-under model is told in a circular issued by Hardy Scales Co., 5701 Atlantic Blvd., Maywood, Calif. The Hardy "Over-Under" indicator is easily and quickly attached to any type beam scale. It is of sturdy, all metal construction, and measures 8½ in. by 14½ in. and weighs 8 lb. The indicator shows instantly the errors in weighing and helps the weighman correct mistakes immediately. The pointer can be easily seen from front or back to check over or underweight.

48
Snow Fighter

Illustrations, description and specifications of a new model of Walter snow fighter are given in a recently issued Bulletin SF-45. The model has the Walter four point positive drive and is powered by a V8 engine developing 200 H.P. Walter Motor Truck Co., 1001-19 Irving Ave., Ridgewood, Queens, Long Island, N.Y.

49
Combustion System For Asphalt Plants

Two new bulletins on its equipment have been issued by Hopkins Volcanic Specialties, Inc. Bulletin 1001 covers the volcanic oil and gas burning systems—a complete "package unit" combustion system for asphalt plants. The units are stated to be easily installed and adaptable to any size and design of dryer. It is also stated that these units give a drier heat, require less fuel consumption and have better temperature control. Bulletin 999 covers Hopkins oil burning equipment. Illustrations and descriptions are given of the Volcanic fuel oil type, the Volcanic Mill for the manufacture of asphalt emulsion, the volcanic mill tar and pitch type and of volcanic mill acid sludge type. Advantages claimed for the Volcanic oil mills include the following: Improved quality of product, better flame characteristics. Increased production. Real fuel economy. Minimum maintenance of the entire oil burning system. No tank cleaning. Uses heavier grades of fuel—uses waste products as fuel. No dead inventories—no fuel stored that cannot be used. Less soot and carbon deposit. Positive control, easier regulation. Steady fires, uniform heat at all times. No clogging of valves and burners. No strainers or filters to inspect and keep clean. Copies of these new bulletins can be obtained from Hopkins Volcanic Specialties, Inc., Alliance, O.

50
Portable Heater

The Chausse Supreme model portable heater is covered in a 4-page circular. This unit is an oil burning space heater especially designed to safely meet the many requirements for portable space heating on construction jobs. Advantages of the heater are cited and specifications are given. Chausse Mfg. Co., Inc., 4453 14th St., Detroit 8, Mich.

51
Coal Mine Maintenance Welding

The first in a new series of "How To Weld It Better" manuals, titled "Coal Mine Maintenance Welding" issued by Eutectic Welding Alloys Corporation, covers in detail the various specialized welding applications found in the field of coal mine maintenance welding, including such problem-cases as "Heavy Cast Iron Repairs," "Dragline Shovel Pinion Repair," "Pump & Compressor Repairs" and similar specific recommendations, together with case histories based on actual in-the-field welding operations. In-

RUEMELIN BLAST GENERATORS

FOR CLEANING BRIDGES— WATER TOWERS—STRUCTURAL STEEL

Many contractors use Ruemelin Blast Generators for cleaning steel work to remove rust, paint and scale before repainting. These machines are also used to remove laitence from cement wherever concrete construction is in progress. A wet adapting nozzle can be furnished to convert dry machines to wet type of operation. Built in several sizes.

Write for Bulletin 36-C

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RUEMELIN MFG. CO.
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SAND BLAST AND DUST COLLECTING EQUIPMENT, WELDING FUME COLLECTORS.

CUT YOUR SOD-CUTTING WORRIES
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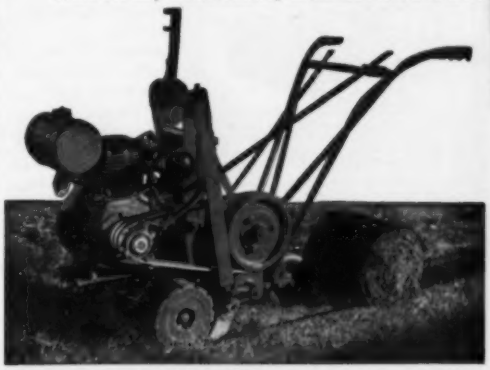
★ **CUTS SOD CLEAN**—The high speed action of the cutting blade insures cleanly cut root ends, which in turn stimulates healthy growth.
★ **CUTS UNIFORM**—Unique design of blade operating under drive wheel produces uniform cut sod.
★ **CUTS EASY**—Strips sod from Green, Tee, Fairway or Nursery, in little more time than it takes to mow.
★ **CUTS COST**—No need to take several men from other duties when you want to do a sodding operation. With the RYAN, one man does the job quickly, and easily with very little "out of play" time.
★ **CUTS ANYWHERE**—The compactness of the RYAN Sod-Cutter makes for easy maneuverability in small or side hill areas.



FOR COMPLETE INFORMATION—WRITE . . .
K. & N. MACHINE WORKS, INC.
871 Edgerton Street • St. Paul 1, Minnesota

cluded in the new manual is a "Standardization Chart" consisting of two pages of tabular matter covering over 50 different typical coal mine maintenance applications and the recommended welding alloys and data for their repair. Eutectic Welding Alloys Corporation, Department "F", 172nd Street and Northern Boulevard, Flushing-New York 58, N.Y.

52

Trucks

A 4-page bulletin has been issued containing specifications for the full line of Ford trucks of GVW from 4,700 lb. on F-1 to 22,000 lb. on F-8. Additional specifications are included on the 1952 Ford truck line-up, covering the light duty models, heavy duty models, school bus models, heavy duty cab-over engine models, and extra heavy duty models. Ford Division of Ford Motor Co., Dearborn, Mich.

53

34E Dual Drum Paver

Features of the new Model WP Worthington Ransome 34E dual drum paver are illustrated and described in a recently issued bulletin. Operating statistics claimed for the new paver include the following: Power loader skip requires only 6½ seconds to travel from ground position to discharge point of 56 degrees low slope. Boom bucket travel speed of 256 ft. per minute. Transfer from first to second compartment requires approximately 6½ seconds (depending on consistency of concrete). Discharge into boom bucket takes 6½ seconds. Worthington Pump and Machinery Corporation, Construction Equipment Division, Dunellen, N.J.

54

Welding Alloys

A new, 16-page, profusely illustrated "1952 Directory" of electrodes and welding alloys issued by Eutectic Welding Alloys Corporation, contains photographs, data and technical information on a series of "Eutectic Low Temperature Welding Alloys" for use on cast iron, steel, alloy steels, copper, brass, bronze, aluminum, magnesium, hard and machinable overlays and for cutting all metals. In addition, two full pages are devoted to a full chart of over 100 of Eutectic's different welding alloys, their main uses, their bonding temperatures and their tensile strength plus many valuable ideas on effective uses of welding. Eutectic Welding Alloys Corporation, 40-40 172 St., Flushing, N.Y.

55

Non-Fusion Welding

An eight-page reprint of a technical paper, "Dilution and Diffusion Aspects of Non-Fusion Welding," presented before the 32nd Annual Meeting of the American Welding Society is available from Eutectic Welding Alloys Corporation, Dept. P., 172nd St. and Northern Blvd., Flushing, N.Y. The paper is profusely illustrated and documented with charts, diagrams, tables and formulae derivations.

56

Protection of Bituminous Roofs

A new 4-page brochure giving detailed application data and listing outstanding uses of Laykold Fibrecoat, a weatherproof mineral-armored asphalt, has been issued by American Bitumuls & Asphalt Co. It outlines the intelligent utilization of Laykold Fibrecoat, for protection of bituminous roofs and metal. It includes specifications, application data, approximate costs, and illustrated, detailed information regarding equipment used in applying the product. American Bitumuls & Asphalt Co., 200 Bush St., San Francisco 4, Calif.

57

Cement Bulker

A new circular describing its cement bulker has been issued by Schuch Brothers. This bulker features a high capacity tank with a low center of gravity. The tank sets level, giving positive weight distribution. Unloading is done by two conveyor screws. Three sizes, 14, 16 and 18 ft. tank sizes are available. Schuch Bros., Machine Co., P.O. Box 3911, Detroit 27, Mich.

58

Technical Literature

"An Investigation of Bridge Foundation Conditions Through Boring and Geophysical Methods." Bulletin No. 22, Engineering Experiment Station, University of Kentucky. This 43-page bulletin dated December, 1951, is by William A. Goodwin, Graduate Assistant, Department of Civil Engineering, University of Kentucky. It reviews the theory and methods of plotting and analyzing data; describes apparatus; gives procedures including field set-up, calibration of instruments and measurement of resistivity; and reviews the results of investigations at three Kentucky bridges. For copy address Engineering Experiment Station, University of Kentucky, Lexington, Kentucky.

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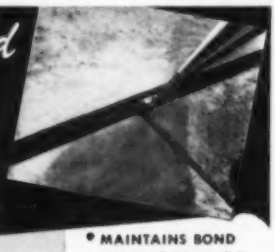
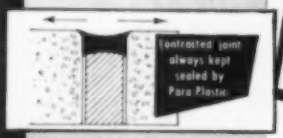


Para-Plastic prevents infiltration of water or other foreign substances under any expansion or contraction conditions of monolithic concrete.



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- MAINTAINS BOND FROM 0° TO 180° F.
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New type Para-Plastic JF for airfield and airport construction. Resists dissolution by Jet Fuel spillage or leaks. All other Para-Plastic features included. Ask for details.

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Fly Ash Specification

(*Continued from page 72*)

pozzolanic admixture that is to be used in class "PAX" concrete as shown elsewhere in these special provisions.

Fly ash shall consist of the finely divided powder or ash which is obtained from the burning of powdered coal. It shall be collected by the electrostatic process from power plants or industrial boilers for which combustion conditions are being controlled uniformly.

Methods of Test

Methods to be used in testing the fly ash shall conform to the following procedures:

A. Chemical Analysis: A.S.T.M. Method C. 114-44.

B. Sieve Analysis: 325 Mesh Sieve, Wet Sieving; A.S.T.M. Method C 115-42 Section 10 (6).

C. Pozzolanic Activity: Pozzolanic activity shall be determined from the compressive strength of 2"x4" cylinders. The test specimens shall be composed of a mortar consisting of two parts fly ash, one part of hydrated lime (high calcium finishing lime) and nine parts of standard Ottawa sand, with sufficient water added to produce a workable mix. The test specimens shall be cured in sealed containers at 70° F. for 12 hours, at 100° F. for 12 hours, and at 130° F. thereafter until the time of testing.

Test Requirements

A. Physical Properties: (1). Fineness —the total per cent of fly ash retained on the No. 325 sieve shall not exceed 12.0. (2) Pozzolanic Activity — When tested in accordance with the procedure that is prescribed in the preceding paragraph, the fly ash-hydrated lime-Ottawa sand cylinders shall have a 7-day strength of at least 600 psi.

B. Chemical Composition:

Silicon Dioxide (SiO_2)	Min. per cent 40.0
Aluminum Oxide (Al_2O_3)	Min. per cent 12.00
Magnesium Oxide (MgO)	Max. per cent 5.0
Sulphur Trioxide (SO_3)	Max. per cent 4.0
Loss on Ignition	Max. per cent 10.0
Free Carbon	Max. per cent 2.0

Storage and Handling

Fly ash shall be protected, stored and handled in the same manner as is specified, for portland cement, in Sections 48-6 and 101-6 in the Specifications.

The fly ash may be furnished on the project in bulk or packaged in bags of such weight as is necessary to permit the dumping of whole bags in the batches of concrete.

When delivered for use, the fly ash shall not contain more than 2 per cent, by weight, of moisture.

Preliminary Samples and Reports

Before fly ash from any individual collection station is furnished for use, the Engineer shall be furnished with a preliminary sample or a certified test report representing typical material that is collected at that station.

During the progress of the work, the Engineer shall be furnished with a shipping report showing the specific collection station from which individual carloads of fly ash are shipped. This report shall be in the Engineer's hands prior to actual use of the material.

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News of Manufacturers

Muntean Promoted by Timken. George J. Muntean has been promoted to the position of assistant superintendent of the Canton bearing factory of Timken Roller Bearing Co., Canton, O. He has been with the Timken Co. since 1933.

Lima-Hamilton Appointments. R. W. Head has been appointed district manager Baldwin-Lima-Hamilton Corporation, Lima-Hamilton Division, Lima, O. His headquarters will be at 1805 North Industrial Blvd., Dallas, Tex., and his territory includes New Mexico, Oklahoma and Texas. He succeeds R. A. Otterness who has accepted the position of sales manager of Contractors Equipment and Supply Co., Lima distributor in Albuquerque, N. Mex. Bob Drumm has been appointed representative for Lima line of power shovels and cranes in Kentucky, southern Ohio and West Virginia.

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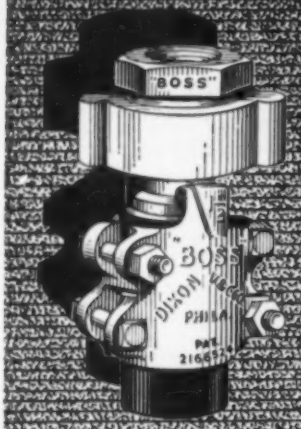

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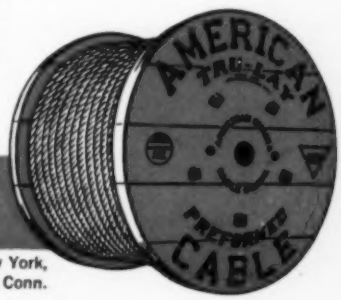

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